# Engineering and Mining Journal

## INDEX

## Volume 136

JANUARY TO DECEMBER

## 1935

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Editorial Director

# Engineering and Mining Journal

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Manager

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WILLARD CHEVALIER
Vice-President

UNEMPLOYMENT in the extraction of minerals declined 4,000 from October to November, 1934, and in the latter month was also 8.4 per cent lower than in November, 1933. Total unemployed in November, 1934, was 10,094,000, of whom only 423,000 were normally engaged in the extraction of minerals, according to the National Industrial Conference Board.

•

IN THE EARLY PART of the munitions investigation, members of the Senate Committee freely charged that wars are incited by the munitions makers. The charge was subsequently soft-pedalled when no satisfactory answer was forthcoming to the pointed question: Which war was brought on by the munitions makers?

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BETTER BEARINGS for high-compression internal-combustion motors are being developed. This points to new uses for materials, particularly cadmium. Automobile manufacturers are now experimenting with cadmium-silver-copper, cadmium-silver, and cadmium-nickel alloys, and at least one medium-priced car is to be equipped with one of the new bearings this year. Cadmium, according to reports from Detroit, is an excellent base for bearings for modern motor cars.

•

AT THE END of December, 130 formal applications for mining loans had been filed with the Reconstruction Finance Corporation. Of that number 76 had been thoroughly studied by the mining engineers of the Corporation's staff. Out of the 76 it was found that only 8 apparently came within the act. In most instances applicants either fail or are not in a position to establish that they have blocked out ore of known value.

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THIRTY-SIX ELEMENTS, besides certain rare earths, enter into the manufacture of radio tubes. During the process, eight gases in addition to the illuminating kind are used. No better object could be found to bear witness to the value of chemical and metallurgical research of the modern day. Yet when business slumped, many companies first sought a saving in the laboratory.

•

NOISE ABATEMENT CAMPAIGNS are under way at home and abroad. Champion noise makers of the mining industry are the stamp mill and the rock drill. The former may be passing, but the latter will probably be with us for a long time to come. The drill's song would be missed, if it were silenced, but the driller could get along without it and undoubtedly do better work. Continuous deafening noise affects the nervous system, even though it go "unnoticed."

•

POWER-COST DISCUSSION at the moment makes it interesting for a mining company to have its own plant, whether hydro-electric, steam, or diesel. Such a yardstick at hand will obviate much argument on the subject, even if it does or does not demonstrate that utility-supplied power would be cheaper. The remotely situated mine has no such comparison to plague it.

•

USES FOR ALUMINUM are steadily increasing. With the powder, Kingsford-Smith made glistening patches on the sea to permit sights for navigation on his recent Pacific flight. An Italian is producing soulful neckties from the metal, if not other dress items. And now a genius provides a device made of the metal for stamping ladies' silk stockings at time of purchase to prevent fraudulent exchange.

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# Dorrco Doings in 1934

Leonor F. Loree, the famous railroad president, remarked at a college board meeting we were attending, that there is a French proverb which says "It is more dangerous to do good than evil, for if you start to do evil you have your conscience as a guide to hold you back, but if you start to do good, there is nothing to restrain you." Events in Washington during the past two years have impressed this most deeply upon me as upon many students of history and economics.

At a meeting of an editorial advisory board recently, a member stated that a study of political, economic and social trends in this country in the light of world history, had led his organization to the conclusion that within six years the '34 price level would increase five fold.

Elected officials blow loud blasts against the power companies, while the meek citizen writes to his paper, "My light bill for a family of three ten years ago was $3.48 a month; now, for five, it is $3.57. My taxes were $80; now they are $256. Please tell me who is robbing me."

The past year has been an eventful one for our company, for we have recognized changing conditions. Heeding James Harvey Robinson's appeal to see things as they are, not as they were nor as we should like to see them, we and our friends in San Francisco have adjusted our relationships happily, leaving them to carry on our former filter business in this country and us to handle their business on the other side.

The energizing effect of P.W.A. appropriations on municipal improvements has resulted in the extension of our sanitary work to a greater number of cities than ever before.

THE THIRTIETH MILESTONE

Last July many of our old friends who were engaged in mining in the early 1900's gathered together with us at our Westport, Connecticut, laboratory to celebrate the Dorr Classifier's 30th birthday.

Many an old friend reminisced on the early days in the West and many more wrote letters recalling the development of the Classifier and its contribution to metallurgy throughout the world.

CLASSIFICATION

The FX Classifier, designed to meet the demand for high circulating loads, is fulfilling the expectations of reduced grinding costs and improved metallurgy in the world's copper districts, and in the gold mills in Canada and the Philippines. Circulating loads of 1200% are an accomplished fact and a new installation is aiming at 2000%.

CYANIDATION

Improvements have been directed toward greater flexibility in aeration and more compact equipment for the small gold mills. The aim has been to bring big mill standards of practice to the mill with the capacity of only 15 to 50 tons per day.

COMPACT THICKENERS

The new Centrepier and Type A Thickeners have no superstructures. The improved Balanced Tray Thickener provides full tray efficiency in shallow tanks. The Washing Tray Thickener gives the small operator a complete, C.C.D. plant in a single unit.

SANITARY ENGINEERING

The Dorr Sifeed Clarifier has demonstrated the advantages of mechanical simplicity combined with central sub-surface feed and peripheral overflow. Chicago's new Calumet plant has 15 of them, installed in 91-foot square tanks; Cleveland's Easterly plant has 16, each 112 feet in diameter.

The Dorrco Flocculator has proved its adaptability to both old and new water plants. Improved flocculation has reduced chemical consumption and increased settling and filtration.

SOUTHERN CHEMICALS

Among the pulp producers using our Continuous Causticizing System are Brown, Bogalusa and Southern Kraft. All of the three Gulf Coast alkali plants use our equipment for caustic soda manufacture—Southern Alkali, Mathieson and Solvay.

PHOSPHATE FLOTATION

The flotation process has been adopted by the principal phosphate rock producers in the South, with marked increase in recoveries. Our equipment has been installed in all of these plants.

COOPERATION AND RESEARCH

A cement company conceived the idea of preparing its mix by the subtraction of an excess constituent from its rock instead of adding other materials. Our research pointed the way to a method which was jointly carried through a pilot plant and into a successful commercial unit, which incidentally has cut quarrying costs in half.

BEET SUGAR

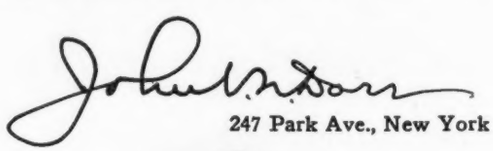
Our Continuous First Carbonation Process is now being used in America for the treatment of approximately 4,000,000 tons of beets annually.

EUROPE

Twice during 1934, I visited Europe in connection with the excellent work being done there by associates in London, Paris, Berlin and The Hague. The work abroad is diversified, including pulp in Scandinavia, sewage in England and the Netherlands, water in France, mining in Africa, lithopone in Italy and phosphoric acid in Germany and Greece.

Hard work, tightened belts, and a veteran staff have brought their rewards to our company this year, and financial recognition, moderate to be sure, to each of us. We are taking our lessons of the past to heart and are moving ahead on all fronts. The world ahead may be a different one, but we shall adjust ourselves to it and "pull our weight."

On behalf of all of us, I extend the Season's Greetings to our friends everywhere in so many lines of industrial endeavor.



247 Park Ave., New York

DORRCO

# Engineering and Mining Journal

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Volume 136 JANUARY 1935 Number 1

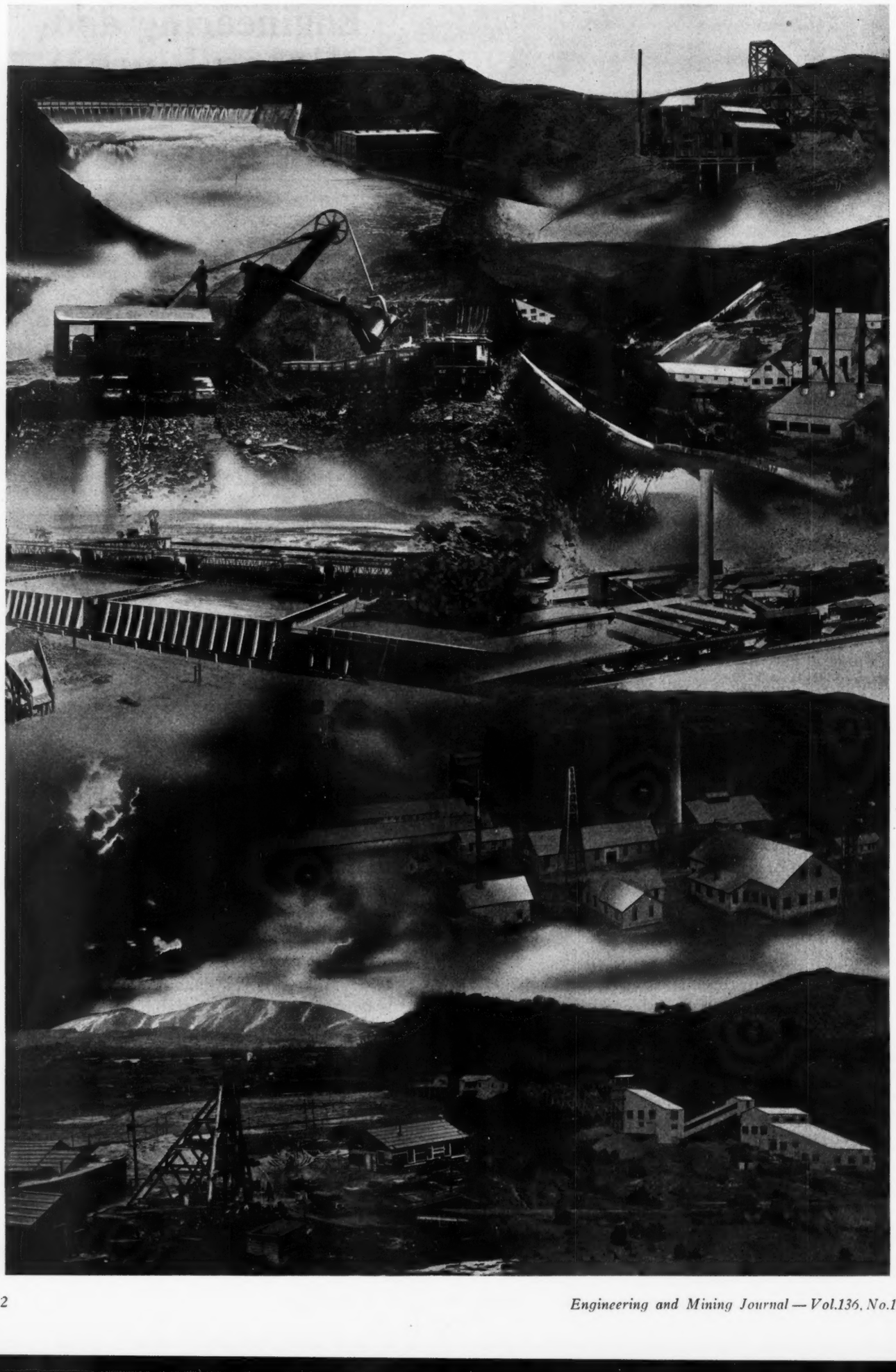
# *Trends Toward Stability In the Mining Industry*

SWIFTLY MOVING EVENTS in the past thirty days lend hope and encouragement to the belief that Nineteen Thirty-Five will witness a concerted movement toward not only recovery but also future stability and security in the non-ferrous metal-mining industry. Unanimity of thought and harmony of opinion within and without the industry prevail to a greater degree than ever before, and show signs of crystallizing constructive action out of the mass of conflicting views that were the inevitable result of the desperate conditions of the past two years. Appropriately, this issue of *Engineering and Mining Journal* emphasizes these matters and presents a summary of forward-looking plans. If the reader finds a surfeit of economic matter, let him remember that the business recovery of the industry is paramount; also that important events have transpired on which he should be intelligently informed.

Most important, there has been a striking conjunction of opinion on the problems of the industry and their satisfactory solution, from governmental, private, and industrial sources. The report of the Planning Committee for Mineral Policy, the views of the American Mining Congress, the recommendations of the Science Advisory Board on the Bureau of Mines and the Geological Survey, and finally the opinions of leaders of the industry are all summarized in this issue. They converge toward one point—the rehabilitation of the mining industry and its establishment on a sound economic basis. Out of them should come an acceptable policy and program vital to future progress and prosperity.

The long-awaited views of the Planning Committee for Mineral Policy, appointed by the President last April, were made public in summary as part of the report of the National Resources Board. They are of primary importance as representing the proper and desirable relation of the Government to the mining industry. That relationship is one of assistance to attain economic stability and at the same time conserve mineral resources. Collective organization and action by the mineral industries is recognized as desirable. In short, self-control by the industry under public supervision of capacity, production, stocks, and sometimes of price, with periodic forecasts of demand by a governmental agency, represent the proposals for stability and security. This type of control is particularly appropriate to an industry dealing with a natural resource rather than a manufactured product, and is deemed necessary to stabilize the industry and protect the interests of the consumer, the wage earner, and the nation's long-time concern for conservation.

In essence this type of control is about what has been attempted but not fully realized under codes, and experience under NRA is recommended as a guide to future control by the industry. That the industry itself favors the extension of modified NRA control will be evident in reading the views of leaders in the industry, and the proceedings of the American Mining



Congress reported in the news pages. With evident harmony on the fundamentals of the problem, it should not be difficult to work out satisfactory details.

The rôles of the Bureau of Mines and the Geological Survey as technical agencies of the Government in aid of the mining industry are emphasized not only by the President's Science Advisory Board, but also by the Planning Committee for Mineral Policy and by the American Mining Congress. The last named has been particularly aggressive in its demand that the Bureau receive support commensurate with the importance of the mineral industries in the national economy. The other two groups recommend the support of continued research and other functions for which these bureaus were established. They must play an increasingly important part in the development of our mineral resources, in their international as well as national aspects.

International problems in the mineral industries will be pressing for solution this year, not the least of which will be that of the so-called strategic minerals, on which we publish an enlightening article. The subject has had renewed public attention partly as a result of the Senate committee's investigation of the munitions business and the problems of national preparedness. It sprang again into the limelight for a brief interval last month when Mr. Baruch, chairman of the old War Industries Board, recommended federal purchase of a stock of tin to be held in reserve. The whole matter, moreover, will be to the fore in the plans for reciprocal trade agreements, to the consummation of which the Planning Comittee for Mineral Policy lends its endorsement. Finally, there are problems in stabilizing world markets for base metals in which United States producers are an important factor. In this connection it is worth noting that one of the Mineral Policy committee's recommendations regarding minerals of which we have an exportable surplus is to "facilitate American participation when desirable in international cartels."

With the whole trend toward realistic thought and action in the mineral industries, a livelier market for their products waits on revival in manufacture and construction. The normal potentialities of that market are daily increasing as obsolescence overtakes the country's manufacturing plant, and the cumulative deficiency in public and private construction mounts to fantastic figures. Restoration of confidence in the capital-goods field will create a renewed demand for metals. And it is precisely for the restoration of confidence that other business groups have sought agreement among themselves and cooperation with the Government. Their objectives: Resumption of private enterprise, renewed capital investment, expanding production and wider distribution of goods and services in order to increase employment and restore purchasing power. Such is the "road to recovery" recently submitted to the President by a conference of representatives of business. It is to be hoped that Business and Government will see eye to eye on the means of reaching the goal. Meantime the mining industry is preparing to put its own house in order as a contribution to the general welfare.

# *Metal Price Chart*

THREE YEARS HAVE ELAPSED since *E.&M.J.* metal prices were published in chart form, and there has been a substantial demand for a new chart that would bring the subject up to date in convenient form. Accordingly we publish as a supplement to this issue of *E.&M.J.* a graphical record in color of prices for copper, lead, zinc, tin, and silver since 1897. The chart contains also some statistical data on world production of the same metals.

## *Historical Summary*

*Engineering and Mining Journal* was founded in 1866 as the *American Journal of Mining,* the title being changed in 1869. Publications with which *Engineering and Mining Journal* has been consolidated comprise: *Coal and Iron Record* (1875); *The Mining Review* (1877); *The Polytechnic Review* (1879); *Mining and Metallurgy* (1902); *The Mining Magazine* (1906); *Mining and Engineering World* (1917); *Mining and Scientific Press* (1922); *Engineering and Mining World* (1932).

The following have served as editors in chief of *Engineering and Mining Journal* and its predecessor publications: G. F. Dawson (1866-67); R. W. Raymond (1867-74); R. W. Raymond and R. P. Rothwell (1874-89); R. P. Rothwell (1890-1901); D. T. Day (1901-02); T. A. Rickard (1903-05); W. R. Ingalls (1905-19); J. E. Spurr (1919-27); A. W. Allen (1927-33); H. C. Parmelee (1933—).

The editorial staff of *Engineering and Mining Journal* comprises H. C. Parmelee, editorial director; A. H. Hubbell, H. D. Keiser, associate editors; W. N. P. Reed, J. B. Huttl, assistant editors; H. H. Wanders, market editor; G. J. Young, consulting editor.

# NATIONAL MINERAL

## Characteristics of the Mining Industry Warrant Production Control Under Federal Supervision, in Opinion of Planning Committee Appointed by the President

RECOMMENDATIONS of great significance to the future stability of the metal-mining industry were made public in mid-December through a report to the President by the Planning Committee for Mineral Policy appointed in April, 1934. (*E. & M. J.*, May, 1934, p. 229.) The report on mineral policy is only part of a comprehensive study of all natural resources, their use and development, by the National Resources Board.

In introducing its report, the committee calls attention to the importance of the mineral industry and to the fact that it has developed without the aid of any consistent national policy. The facts that warrant special consideration for the mineral industry, and a unified policy for its guidance, are: (1) That minerals are exhaustible and non-reproducible; (2) that some minerals do not exist in the United States in quantities adequate for national welfare; (3) that others exist in present surplus; (4) that geographic distribution is fixed by nature and cannot be changed by enactment, thereby determining trade routes and trade areas, both domestic and foreign; (5) that there are special hazards, both physical and economic, in mining; (6) that closing down a mine may result in losses far more serious than closing down a factory.

● **THE COMPLETE TEXT of the Mineral Policy section of the report of the National Resources Board has not yet been made public by the President. The accompanying article, therefore, is only an abstract of a summary prepared by the Board for public release. Of necessity it omits not only some of the problems discussed in the full report, but also the explanations and arguments supporting the Committee's position. Final judgment on the merit of the report should be reserved until the complete document is available. In the meantime it should be studied carefully as the first public attempt to express a mineral policy for the United States, and as such of vital importance to the non-ferrous metal-mining industry.**

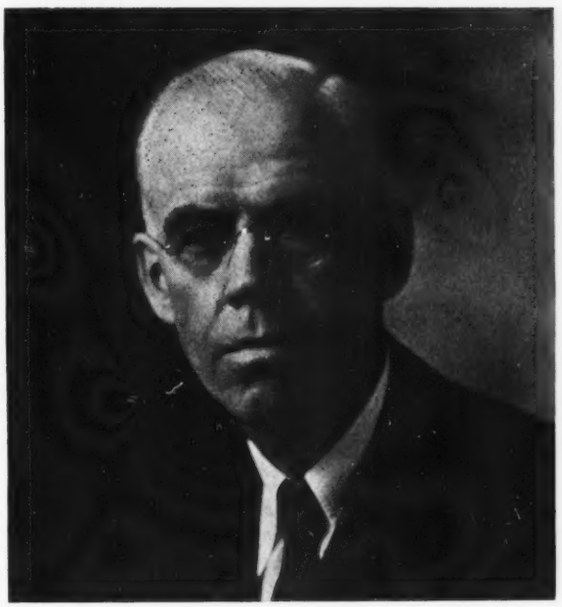
The outstanding public question arising from these conditions is that of conservation, which is defined to mean not hoarding but rather orderly and efficient use in the interest of national welfare, both in war and peace, without unnecessary waste either of the physical resources or the human elements involved in their extraction.

### Significance to the Industry

To the non-ferrous metal-mining industry the special significance of these facts is that, in the absence of any form of cooperation or control, production may easily outstrip demand, and surplus plant capacity may lead to ruinous competition, which, in turn, may bring on wage reductions, loss of capital, and waste of resources. These elements of instability result in unprofitable operation, and naturally suggest the need for some type of control if mining is to prosper. Recognition of the fact that mineral-resource industries are in a class by themselves has led many thoughtful persons to support the idea of production or price control in some branches of mining, although opposing it when applied to manufacturing or trade. Whether by price-fixing, control of output, or other means, it appears that some method of eliminating excessive competition, with its attendant waste, is desirable, if carried out under the proper governmental supervision.

For those branches of the industry that are burdened with present surplus stocks and plant capacity, such as copper and to a less extent lead and zinc, the committee's general recommendations are: that the emergency provisions of the NRA codes for production control be continued in some form, and that action by Congress be considered establishing an agency to authorize control of production and capacity, and in special circumstances of prices, where uncontrolled competition is found to result in resource waste. The

# POLICY PROPOSED



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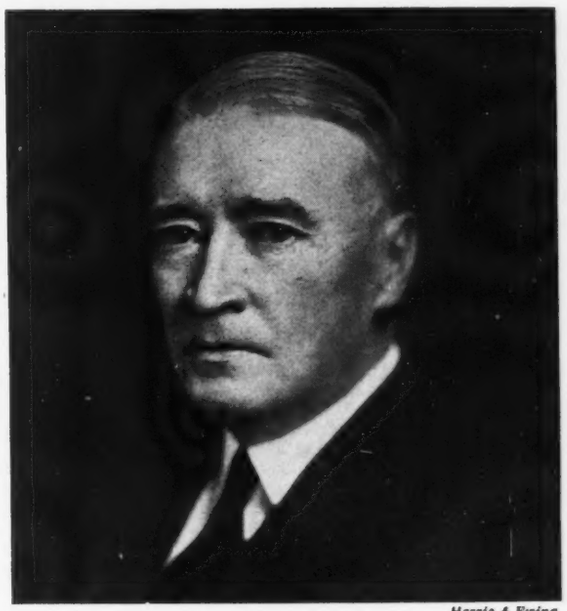

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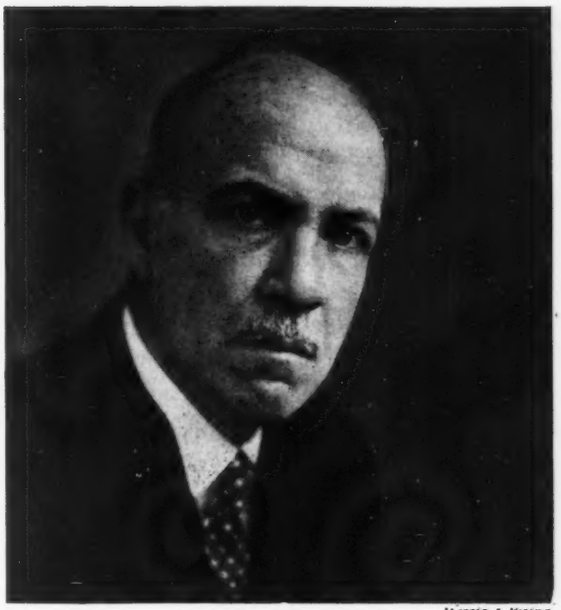


Harris & Ewing

J. W. FURNESS
*Chief, Economics Branch, U.S. Bureau of Mines*
*Washington, D. C.*

*Members of the President's Planning Committee for Mineral Policy*

committee believes that plans for stabilization should originate within the industry, but should include publication of full and complete statistics covering all phases of supply and demand, forecasts of consumption by a public agency, and a limitation on accumulating of excessive stocks.

With respect to those minerals of which there is an insufficient supply, the committee recommends that public encouragement should be given to exploration for new deposits, development of substitutes, and technological research for making low-grade supplies commercially available. A

system of bonuses for discovery is suggested as a substitute for tariffs, which usually have not only failed to develop adequate supplies but have hastened the depletion of the known resources.

The committee reviewed the administration of minerals on public lands under the leasing system adopted in 1930, and found the advantages to outweigh the drawbacks. In its judgment the leasing system should be extended to all publicly owned mineral deposits in the United States. Minerals that have passed into private hands, however, should be privately exploited, with governmental supervision where necessary. The important subject of taxes on mines and on reserves, with particular reference to their effect on overdevelopment and resource waste, calls for further study.

## Importance of Scrap Metals

The importance of scrap metals at the present time and as a reserve against future needs is explained; and the committee recommends consideration of prohibiting the export of scrap of metals for which the domestic supply is deficient. It also recommends that more complete statistics concerning secondary metals be compiled by the Bureau of Mines.

Scientific and technologic agencies of the Government can be important factors in the wise use of the country's mineral resources, and their work should be strengthened. Economic and statistical services should be concentrated in the Interior Department, under separate direction from the administration of mineral codes or production control.

One section of the report is devoted to international trade in minerals and the obstacles to normal flow of trade that have been inspired by economic nationalism. With respect to minerals of which the United States has a present exportable surplus, the committee recommends the following courses of action: (1) give fitting consideration in negotiation of commercial agreements; (2) seek fair tariff and trade treatment by foreign governments; (3) maintain the Webb-Pomerene Act; (4) facilitate American participation when desirable in international cartels; (5) avoid artificial stimulation of exports by special concessions in freight rates or shipping subsidies not extended to other commodities; (6) discourage importations which aggravate anti-conservational conditions of surplus development.

With respect to minerals for which the United States is largely dependent upon imports, it is suggested that a wise policy should include: (1) Consideration of existing tariffs in the light of domestic reserves; (2) protection of American interests against attempts to maintain excessive prices on our needed imports, by the operation of cartels, intergovernmental agreements, export duties, or other restrictions; (3) restriction or regulation of the export of scrap; (4) establishment of war reserves of imported minerals essential for national defense; (5) maintenance of trading lines carrying these minerals.

## Service of the Government

In reviewing the Committee's report the National Resources Board makes the following observations by way of summary: In the mineral field, the problem of balancing supply and demand is essentially national and requires assistance of the national Government. The chief service which the federal Government can render in either the long- or the short-time problem is to assist the mineral industries to attain economic stability. Stabilization is necessary to preserve capital, to maintain reasonable wage standards and steadier employment, and to minimize resource waste. Stabilization requires a central organization and collective action. We therefore recommend that permanent provision be made to authorize control of competition after the expiration of the present National Recovery Act. We shall not attempt to outline the specific steps applicable in each industry, but, in general, the authorization should cover the control of production, of capacity, of surplus stocks, and, where necessary, of price. To facilitate the adjustment of production to requirements, periodic forecasts of consumption should be made by a Government agency in collaboration with representatives of producers and consumers. The authorization of control should be made contingent on acceptance of whatever safeguards are thought necessary by Congress to protect the interests of the mine workers and the consumer, and upon assurance by the industry concerned that action will be taken to minimize resource waste.

In addition to these immediate steps, there is need of continuous study and review of national policy in relation to the minerals, and of the results obtained. This might well be carried on by a permanent mineral policy committee working in cooperation with the National Resources Board. The present committee is already studying a number of special problems centering around mine taxation, tariffs, foreign trade, capacity, and reserves, concerning which recommendations will be made later.

**DELIVERING RUSSIAN MANGANESE ORE from mine to stockpile by rope tramway, in the Tchiatouri district, Georgia, U.S.S.R. From this region has come in recent years a large part of the United States steel industry's manganese supply**

# Strategic Minerals and Metals

## Present Peace-time Problems in Economic Nationalism

## Some Recommendations Are Made That May Prove Profitable


*R. S. McBride*

*Washington, D. C.*


*A strategic mineral, in the author's definition, is one that is essential to industrial operations but that is available only from foreign sources largely or wholly controlled abroad*

•

STRATEGIC MINERALS are just as important in peace time for business as during war time for Government. The world-wide race for economic self-sufficiency has raised these commodities to a level of immediate importance which their inherent characteristics do not always deserve. But whether deserved or not, these materials command attention and concern in almost every division of the mineral industries.

Governments taking a hand in business throughout the world have occasioned much of the difficulty now encountered. Political considerations have introduced new competitive factors, both in supply and in price. Embargoes, import and export quotas, and a multitude of other trade regulations now dominate many of the mineral industries formerly free from such complications.

For each nation at any particular time there is a different set of strategic minerals. The principles which make tin a strategic mineral in the United States, of course, eliminate this important metal from the strategic class in producing countries, such as Bolivia. World-wide generalizations are, therefore, not feasible. Comment must be limited to specific countries; for space reasons, in this article, to the United States.

Each of the outstanding ferro-alloying elements has had strategic importance in the United States at various times—namely, chromium, manganese, nickel, tungsten, vanadium, cobalt, and zirconium. Four other metals must also be considered—quicksilver, tin, platinum, and antimony. Thus there are eleven metallic or quasi-metallic products of the mineral industry deserving analysis in the United States economy.

As a coincidence, we find just an identical number of non-metallic minerals which have had, and some of which still deserve, like consideration. These are iodine, potash, nitrates, mica, graphite, bauxite, magnesite, fluorspar, pyrite, barite, and asbestos. Some would have us add china clay and petroleum, but for the present purposes neither seems to deserve consideration here.

If one wanted to go on farther into non-mineral fields, one would find another equally interesting list in the products of specialized agriculture. Just as a matter of interest, this list is indicated. There are the three medicinals: quinine, opium, and nux vomica (strychnine). Coffee, tea, and sugar of the food group accompany camphor, shel-

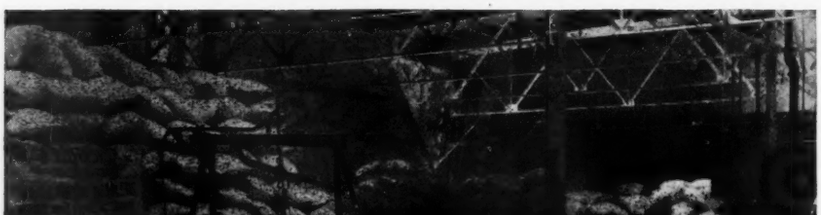
lac, cork, and flaxseed from other divisions of agricultural activity. Jute, sisal, hemp, silk, and wool all give concern to the textile manufacturer and user, with hides and rubber as outstanding import requirements of industry, and cocoanut shells for gas-mask charcoal as a highly specialized war "strategic." Of course, none of these deserve more than mere listing here.

Formerly, when only war-time considerations were important in such listing, the strategic minerals were defined as those needed for military purposes but available from home sources in such limited quantities as to make the nation dependent on interruptable imports. A modification of that definition seems warranted for the present industrial interpretation. It is perhaps better to say that a strategic mineral is one essential to industrial operations but available only from foreign sources largely or wholly controlled abroad.

Under this narrower definition, a shortening of the list of minerals, of course, occurs. Furthermore, advance in chemical technology, together with exploration and development of new American resources, has modified the classification of certain commodities significantly within very recent years. Under the new conditions, generalizations are difficult or dangerous. Interpretation must be by individual commodities to be reliable and useful.

Chromium, manganese, tungsten, and nickel are unquestionably still strategic materials of outstanding importance to the steel and the alloy business of America. Each has peculiarities, and solution of the problems attaching to each demands a particularized program. But they are alike in two particulars. They are vital to industrial affairs both in peace and war. They are not available at a reasonable price in adequate quantities to supply this need without import from foreign sources. Later four distinct policies for these important alloying metals will be suggested.

Vanadium, formerly on the strategic list, is now largely available from domestic sources that promise generous supply at least for some time to come. Hence that alloying element can well be omitted from further strategic consideration of both industry and Government.



**BANKA TIN from the Dutch East Indies awaiting removal after being unloaded from a boat on a pier of the Bush Terminal, Brooklyn, N. Y. Each ingot weighs 80 lb. and is marked in the bar to indicate the source of origin**

The two other alloying elements, cobalt and zirconium, often stressed as strategic metals, are not available from domestic sources in satisfying quantities. But their relatively lesser importance makes them not convincing claimants for first rank in the strategic-metals list. This is particularly true because of the possibilities of substitution and interchange of metals in making alloy steels. Both these elements are perhaps justifiably second-rank candidates in the strategic classification. As such they deserve thoughtful study by the Government and by the principal industrial users. But they do not demand anything approaching national policies.

Among the non-ferrous metals which have commanded some attention there are two that no longer deserve place on the strategic list. Aluminum, once so discussed, was really properly on the list only because its raw material, bauxite, and the incidental processing material, cryolite, came formerly largely from foreign ore sources. The metal itself, of course, never deserved place on the list. With an abundant supply of fluorspar from which to make artificial cryolite, and with domestic bauxite resources proven beyond doubt to be significant, neither aluminum nor its raw material longer really qualifies for strategic classification. This is a correct conclusion, despite the fact that large import of bauxite, perhaps continued import of cryolite, may be expected merely as a measure of economy. But this economy is not sufficient to cause jeopardy to the industry if foreign supplies should at any time be threatened. Aluminum would still continue under those conditions to be available with a very moderate, perhaps even negligible, increase in cost.

### Antimony

A second deletion from the strategic non-ferrous metal list appears somewhat justified in the case of antimony. Formerly the United States was dependent almost altogether on foreign supplies of antimony ore. Now domestic supplies in large quantity at a fair price are promised convincingly. The supplies may not, probably will not, supplant imports altogether; but they are sufficient in quantity both to care for emergencies and to stabilize the price which foreign producers might venture to ask.

In the case of antimony, there are also the continued investigations in many laboratories looking to the supplanting of antimonial lead for its big application in the field of storage batteries. Definite progress seems to be occurring in this work, and at least antimony is to have an active competitor, if not a fully effective replacement material, in this use. As progress is made toward replacement of antimonial lead by another form of lead alloying, the strategic nature of antimony declines correspondingly. Perhaps it is best to say that this element remains in the second class of strategic materials for the present, with prospect of full elimination from the list as a result of anticipated technologic research.

As in the case of ferro-alloying metals, there remain, then, three Class 1 strategic non-ferrous metals. Each of these three deserves separate handling and recommendation as indicated in the discussion that follows. The elements are, of course, quicksilver, tin, and platinum.

The story of synthetic nitrates is too well known to deserve more than mention. America is actually an exporter of nitrates. Certainly this non-metallic

mineral product can by no stretch of the imagination remain on a strategic minerals list, even though Chile rues this conclusion.

Likewise, potash should be eliminated from the strategic list unless the American Government should fail to take the steps appropriate both to protect domestic resources and to enable sound economic development to continue despite governmentally organized foreign competition. There is, to be sure, a problem here, but not of strategic minerals. Rather, it is one of foreign government-aided manipulation of price and production, which deserves separate discussion as an independent principle of mineral policy.

Iodine development in the United States from oil-well brines gives promise of eliminating Chile as a dominant factor in the supply of that element for American chemical industry. In this case, too, a new United States policy for the protection of an infant industry is essential. The industry has demonstrated its worth and that it deserves such protection. United States iodine producers have lowered costs to a point causing a decline in iodine market price from over $4.50 a pound to approximately $1 a pound. Unless the foreign monopoly is permitted to demolish this United States industry, a stabilization of supply, emergency reserves of satisfying proportions, and fair prices will be maintained. Assuming proper government action for iodine, as well as for potash, iodine must also be eliminated from the list of strategic non-metallics.

For many years pyrite was regarded as a strategic mineral, but United States production of sulphur has made such consideration no longer necessary. Domestic development of fluorspar and huge new reserves lately discovered more than warrant the omission of that non-metallic also.

Of the six remaining non-metallic materials deserving attention, mica in the form of electrical sheet, and graphite of crucible grade, are the only two that seem to deserve first-class recognition. Perhaps of second-class rating, magnesite deserves some attention; asbestos and barite would be included by some specialists; and occasionally one finds those who argue that china clay for peace-time reasons must be so classified. None of these commodities, however, ranks on a national basis in a class even approaching those given primary classification above.

### Emergency Reserves

In the case of chromium, interested industry maintains within the borders of the United States a reserve of ore and partially or fully processed metal and alloy equal to an estimated eighteen months' demand, or more. There may be a question as to the adequacy of an eighteen months' supply of this sort, but there can be no reasonable question as to the effectiveness or desirability of this system of preparedness, which serves military purposes and ensures price stabilization.

For certain other metals in which the Government, as well as industry, is concerned, the building up of reserves within the United States seems a logical necessary step, both for the benefit of industry and for the protection of the Government. In fact, for all six metals—manganese, nickel, tungsten, quicksilver, tin, and platinum—some degree of such stock maintenance seems warranted. But the degree varies and the approach in each individual case would logically be modified significantly.

From a world standpoint there has been but one major discovery of tungsten during the last ten years. The world's supply is being depleted, and therefore the domestic supply, such as it is, becomes of greater importance to the consumer. During the last few years an area has been developed in the United States, which is of minor importance, but it bids fair to be able to produce only for a few years and then only part of the needs of the United States. A policy in reference to the mining of tungsten domestically is one that should be taken into consideration at an early date by such organizations as the National Resources Board. A plan of strict conservation and use only in work of major importance is believed by some to be necessary.

In the case of nickel, for example, there appears to be no adequate substitute if one wishes to achieve the properties of certain alloy steels and other products. But, fortunately, the world's greatest reserves of nickel are at the door of the United States and under the control of International Nickel Company, which, to say the least, is a business enterprise having friendly relationships in the United States, though British-owned and dominated.

In order to get greatly alarmed over questions of nickel supply, one would have to presume either the unthinkable condition of military controversy with Canada or the almost equally improbable attempt of International Nickel execu-

**QUICKSILVER in 76-lb. (net) flasks, on a pier on the North River, New York City, after arrival from abroad. The iron flasks, when empty, weigh 14 to 15 lb. They are 15 to 16 in. high and 5 in. in diameter. Spain and Italy are the principal foreign sources of supply**

tives to raise the price of this metal excessively on the United States market. The latter contingency is improbable, largely because of the selfish considerations of prospective future demand that would be jeopardized through any such attempt to profiteer. Under these circumstances, it might be the better part of discretion to have within the United States substantial stocks of nickel and its alloys, but the purpose of such stock maintenance should be recognized as being an effort directed solely toward price stabilization and prompt delivery. In other words, nickel, though technically qualified in peace time as a first-class strategic metal, does not in spirit fully so qualify.

Both tin and quicksilver supplies for the United States seem altogether sub-

ject to the decision of enterprises dominated—even directed—by foreign governments. Ultra-jingoistic theories can readily evolve from such a narrow premise. That type of conclusion should be avoided. But a realistic approach is still warranted.

Seemingly, for effective results, government must deal with government. Under these circumstances, Uncle Sam must tackle as his clear duty the problem of dealing with Spain and Italy as to quicksilver supply. He must likewise frankly press the problem of multi-government manipulation in the case of tin. It is evident from the very character of the membership of the National Planning Board and its sub-agency on mineral policy that this problem is to be frankly, realistically faced. In fact, the recommendations of the Planning Committee for Mineral Policy may become public almost simultaneously with this article. To attempt a forecast regarding them is both indiscreet and unnecessary. All that need be said now is to emphasize the importance of prompt comprehensive action with reference to such metals and situations as are here under consideration.

### Quicksilver Reserves

Again it should be emphasized in this connection that peace-time considerations are just as important as those of military preparedness. Take the example of quicksilver specifically. If the price of quicksilver were to advance to $125 per flask, it is reliably estimated that at least 70 per cent of the United States requirements could be furnished profitably from Arkansas resources alone. However, under prevailing conditions, with quicksilver at approximately $75 per flask, virtually no production is warranted there. Perhaps it is fortunate that this is so. The quicksilver mineral reserves of Arkansas and of the rest of the United States are not great. They are, therefore, exhaustible within measurably short periods if continued production were pressed. As a national policy, it would seem, therefore, far better to maintain these reserves in the ground available in case of need rather than to exhaust them by encouraging unduly high prices.

If one adopts this type of conservation as a national policy, one must then, of course, face realistically one corollary fact. The owners of quicksilver reserves and the mining interests and workers affected are at least potentially worthy of some consideration for relief. It would not be surprising if the Government should come to the conclusion that actual federalization of reserves of this character was warranted in order that control of the mineral bodies for future use might equitably be demanded without unreasonably long deferring production, to the detriment and injury of the owners of minerals or mineral rights.

Subsequently, some degree of labor relief might be made necessary. But when discussing in terms of millions unemployed, the few hundreds or thousands here affected create no new problem of consequence. They add negligibly to the general problem of reemployment. Hence this phase of the subject should be placed in the class of local political relief and not be allowed to interfere with a sound national policy. The cost of carrying under Government ownership the wanted reserve might also prove less than the necessary relief in taxes to private owners if they were asked to hold the ore for the national convenience.

### The Tin Problem

The tin problem is quite different domestically than the mercury problem, though the two problems are alike in that foreign governments are involved. There are, in fact, within the United States no demonstrable occurrences of tin worthy of serious commercial rating. Seemingly, therefore, the United States Government must deal with other governments and negotiate a businesslike arrangement for supply from those reserves that are economically exploitable under present or prospective conditions and prices.

It is sincerely to be hoped that some of the pending trade treaties under negotiation will furnish a medium for a successful arrangement solving the tin-supply question. A continuing arrangement of this sort seems necessary. It is not enough to have Uncle Sam, or interested industry either, bring tin supplies into the country to maintain a reserve against anticipated needs. Such arrangement might solve the military aspect, but is far from adequate to stabilize tin prices for industry in peace time.

Chemical investigators are, however, not idle in this field. It appears likely that much of the tin requirement may be eliminated by substitute lacquers or finishes. A lacquer-lined food can is already a demonstrated success for certain commodities. Lacquer finishes in lieu of tin plate are, of course, always a possibility in many, if not most, of the tin-plate uses where tin is employed by habit and convenience rather than by necessity. Armed with the possibility of substitution, American negotiators do not enter defenseless into the prospective negotiations for an adequate, reasonably priced tin supply. Their persuasiveness may, indeed, be increased as they appreciate and emphasize the technologic advance which American industrial research ensures.

### Platinum Metals

Even more than in the case of tin, substitution has become a factor in determining platinum metal policy. The use of vanadium catalysts has indeed deprived these precious metals of one of their major industrial applications, that of catalyst for sulphuric acid manufacture. Furthermore, platinum and the allied rare metals are very little exhausted during use. Hence the maintenance of working stocks only slightly greater than commercially necessary affords both price stabilization and wartime preparedness. Some will argue that the United States should hold still greater stocks of platinum metal reserves, perhaps justifiably. But no one need argue that it would be a difficult thing to fix a policy which would ensure both industrial and governmental protection against difficulties with this group of precious metals during either peace or war periods.

The manganese problem, perhaps more discussed than any other of the strategic mineral questions, has been much confused by partisan propaganda and vitriolic controversy. Without attempting to referee the differences of opinion, it is possible to set down the few principles that are of major importance.

Manganese can be produced in the United States in substantial quantities—*at a price*. The controversy is largely as to how much the price would have to rise in order to stimulate this United States production. Some of the occurrences of manganese are commercially workable on a competitive basis with the rest of the world because of peculiar conditions. These, however, are not equivalent to a large part of the domestic demand. Artificial assistance, therefore, is obviously essential, and the major controversy on manganese centers around the question as to what and how much assistance should be given by the federal Government.

### What Is Conservation?

In a few instances, manganese introduces a serious question as to the proper definition of the word "conservation." One such problem in particular has plagued Washington lately. It relates to a mine in which there is a residual orebody, reliably estimated to amount to say 100,000 tons of manganese. Unless this orebody is worked out in the reasonably near future, the mine will cave or be flooded and this ore reserve will be irretrievably lost. Some think, probably rightly, that this district might well receive a work-relief assistance, enabling the production of this ore and the preparation of a concentrate from it suitable to keep either under private or public ownership. It would seem most logical that the Government, if affording monetary relief in this connection, should take and hold the concentrate so produced in the most suitable form for actual Government reserve. Thus the employment relief afforded would be represented in tangible property having real usefulness. And this usefulness would be im-

mediate in stabilizing domestic conditions and prospective in the way of a military reserve against potential future emergency.

The Cuban manganese problem has also roused much discussion. In effect, the producers in the island republic have a quota under the NRA. This obviously results in curtailment of employment in the United States, which makes it somewhat difficult to explain under the philosophy that NIRA is intended to give primary aid to United States workers. Some of the reasoning which underlies the aid to Cuban manganese, of course, rests on the theory that we must maintain supplies available in time of emergency without attempting to keep open long lines of ocean haul. It is obviously a highly controversial question as to whether it is best to accomplish military preparedness by quotas to Cuba or by other means.

In manganese still another question arises among those producers who claim that aid should be given them in order to develop metallurgical processes. Those who so argue, of course, are looking forward to the time when the United States reserves could be made commercially usable through improved technology. Uncle Sam has supported that theory to the extent that the Bureau of Mines conducted over a period of ten years and more an elaborate manganese metallurgical study. As a result it seems well established that in times of emergency a fair, though far from abundant, supply of manganese could be had from domestic reserves. But it seems equally convincing as a conclusion of the Bureau's investigations that industry would pay much more per unit for the manganese so produced, even though the best technology yet available and the best available resources were combined.

Still another school of manganese partisans would have Uncle Sam build up within the borders of the country large stocks of ore or concentrate of high grade. Some believe that this should be owned by the Government and held intact as a military reserve. Others much prefer that such a reserve when established shall be quasi-commercial, in order that it may exercise proper leverage on peace-time prices and prevent any alleged desire to exploit American users becoming effective in fact. One proposal has been considered which may work out an ideal combination of Government and industry, accomplishing both establishment of the desired emergency reserve and an effective commercial supply.

As already indicated, there are no sweeping generalizations for all times or all commodities safely applicable to strategic minerals. But the facing of these problems individually is today both urgent and feasible. Much may be expected from such objective study as is likely to come through the work of the National Planning Board. If political and legislative considerations do not become unduly emotional, real progress of benefit to all responsible divisions of the mineral industries that are affected may be hoped for.

**CHINESE TUNGSTEN on its way to market, which means, among other places, the United States. Labor is cheap and methods are primitive. Manual work plays a major rôle in production as well as in the transportation of the ore**

**CHINA continues to dominate the world tungsten market and operations are still expanding after the industry's setback in 1932. The important producing district is in the southern part of Kiangsi province. Other districts are in Hunan, Kwangtung, and Kwangsi**

**LOADING CUBAN MANGANESE ORE on a vessel in Santiago harbor. By virtue of the existing treaty between the island republic and the United States, its manganese is admitted duty-free, thus being on a par with ore of domestic origin in this respect**

Wide World Photo

**Winter salutes the Capitol, at Washington**

# New Legislation

## Confronts the Mineral Industries

**Specialized problems surmount in importance even the outstanding economic questions of taxes, budgets, and social legislation**

*Editorial Staff Interpretation*

BUSINESS of all types must meet problems of budget making, federal taxation, and social legislation during the current winter. In addition to those burdens, the mineral industries must confront equally difficult matters which bear on the fundamentals of national mineral policy. And, too, there are also highly specialized phases of taxation, labor adjustment, and resource development that have peculiar interest for the mining and mineral-marketing executive.

The Planning Committee for Mineral Policy has made its preliminary report. The President is expected to present his interpretation and recommendations on the basis of that document early in the session of Congress which opened the first week of January. Until the President's message has been formulated and transmitted, no one can tell exactly what course is first to be steered. But it is not too soon to anticipate, on the basis of well-established trends of Washington thought, some of the major factors by which the New Deal will undertake to solve these problems.

### Mine Taxes

Lower, rather than higher, mineral taxes may be hoped for as a result of one persuasive argument which seems to have acceptance in Washington. According to the proponents of this idea, tax on mineral reserves tends to encourage exploitation, to destroy real conservation, and to favor the few as against the many. For all three reasons, the influence of the federal Government may be turned toward a new policy of severance tax. This would tend to lighten the tax on mineral reserves as a resource which should not be unduly exploited, rather than, as now, almost on the basis of a crop.

It is difficult to say how potent the spokesmen for this theory will prove to be. It must be recognized, of course, that their influence in Washington can extend only to federal taxes. But with the influence of the federal Government ramifying out through every state capital, Uncle Sam's leadership may be made sufficiently impressive to encourage gradual state-tax adjustments in conformity with this idea. If the mineral industry can bring the so-called Silver Bloc of Western Senators into line on this theory, an important and definite new policy of taxation for the mineral industries may take embryonic form even so soon as this current session of Congress.

### Public Ownership

Not the least of the mineral industries' problems during the winter will center in the question of the extent to which federal Government influence should enter into mining activity. Some of the more radical New Dealers would like to see Uncle Sam as proprietor. These members of the Administration are, fortunately, few in number. They are, however, so vocal and influential that they cannot be altogether ignored.

A second somewhat less radical, but still ultra-progressive, group would have Uncle Sam become owner but not operator. This group argues that the Government should recapture under public ownership the exhaustible resources of certain minerals in order that it may adequately control the production and exploitation of the products of American mines. However, these advocates recognize the difficulties of public operation of a business like mining and mineral marketing. Hence they would grant to private enterprise by lease or contract the right of development, much as the grazing or timber-cutting rights of national forests are now granted to cattle men or lumbermen.

### A Smaller Group

This group is probably smaller than the outright ownership-operation group. But it is, because a little less radical, perhaps a bit more potent and persuasive, especially with respect to such minerals as the quicksilver of Arkansas and, even more, potash in New Mexico, where the occurrence is largely on public lands owned by the state and federal governments. This group may achieve important influence by new legislative enactment. Fortunately, however, the arguments that prevail with respect to a few commodities of this type are ob-

viously not applicable to most metallic minerals nor to the majority of nonmetallics.

Mining men should recognize that the trend towards Government participation in mineral affairs is often encouraged by the mineral industry itself. This is true whenever the miner goes to Washington asking for monetary aid. Executives of the mineral industries must not forget that on such occasions they are likely to pay an indirect price of policy concession when they place themselves in the hands of Uncle Sam as money lender. In this respect, public officials as bankers probably are not much different in philosophy than the private money lender. Indeed, Uncle Sam may prove to be just as much of a Shylock when the time of settlement is reached. The bigness of organization does not mean bigness of heart. It means, rather, difficulty of special concessions and ruthless application of rules.

The mining industry has been accorded certain aid in the way of loans from the Reconstruction Finance Corporation to facilitate commercial operation in fields not given adequate support by commercial bankers. The legislative enactment of the last Congress which arranged for this was welcomed enthusiastically by many. The results have been very disappointing, both to the mining industry and to interested Government officials as well. There will be many advocates of varied theories for the expanding of this Government loan opportunity. Some relaxation of the rules prerequisite to securing a Government loan may be expected. But, inherently, the problem seems so difficult as to give little prospect of full solution by legislation this winter.

The inherent difficulties which lie between operation and profitable marketing make loans of this character decidedly "slow." The very factor which makes a commercial banker unwilling to lend makes the devising of a rule for Government assistance most difficult. One needs recall only the tremendous difficulties encountered in trying to give relief to those who made sincere sacrifices for World War mineral development to know that drawing a line between harshness and careless prodigality by federal enactment is difficult, if not impossible. Few would welcome a return of the many controversial issues that never were fully solved by the War Minerals Relief Commission. Certainly, Uncle Sam's experienced workers would not like to be again pitched into such a sea of controversy. An over-generous or loosely planned loan policy would mean all of that—perhaps more. Great progress this winter is, therefore, not to be expected.

Direct money gift to an industrial enterprise by government is unquestionably subsidy. But where does one draw the line in defining a valuable consideration granted to industry, let us say in the form of government-financed industrial research, or in the way of geological exploration? The National Resources Board's report presumably is going to compel attention to some of these questions.

Mining interests may well organize their thinking in anticipation of real controversy when this set of problems is under debate in Congress. The most potent arguments will be required for persuasion of the legislators to give further aid that is really needed in order that the American industries can serve American demand most economically. Some of the questions that will require answer deserve much advance study. Among them are:

What additional geological resource studies deserve immediate Government appropriation?

What added funds should be made available for the Bureau of Mines to stimulate its work—economic, safety, technologic research, even quasi-industrial development?

What new assistance must be accorded to protect developing industry other than tariffs—quotas for example?

Shall the Government by actual purchases of surplus production stimulate current operations while creating mineral reserves against future emergency possibilities?

Where breakdown of domestic industry threatens without money subsidies, how far should the Government go, if it should participate at all?

These are questions on which no two may exactly agree, but they are questions on which some form of compromise may be demanded in the coming session. Not all of them will be settled broadly, some merely with respect to special instances, but they are live, serious, pressing questions.

Several domestic industries require a new type of protection against foreign government-stimulated competition. Customary tariff barriers are either politically inexpedient or practically inadequate. Some sort of import quota seems essential for these cases.

Iodine, potash, and a few other mineral products are the outstanding examples of present interest which illustrate this problem. Congress is doubtless going to be asked to consider the question whether these new mineral industries do not deserve a reasonable share of the domestic market. The justification for such allotment is principally that the domestic producers have greatly lowered the price to American users on commodities which they market. In doing this they have, to say the least, irritated the foreign producers previously comfortable cartelized. Retaliatory measures of a familiar sort have been under way and there is no buffer in antitrust laws to shelter these rather tender new projects from foreign attack.

Even the most important customer group interested in potash believes that the present market price is too low. Fertilizer men fear that this price is going to ruin the domestic producers and then result in an opportunity for an unwarranted price rise as soon as foreign monopoly regains full control. Whether Congress will act on proposals for quotas restricting imports to a reasonable share of the total domestic business remains to be seen. If that principle cannot be adopted either under administrative supervision or by some sort of fixed legislative arrangement, the mineral industry will have to anticipate trouble for some units of American mining.

The national vision suffers from a serious economic blind spot with reference to factual information on scrap and secondary metal. The very limited effort which the Bureau of Mines has been able to give to statistics in this field represents nearly the total contribution by Uncle Sam to the solution of a metal and mineral problem that today outweighs many problems that are receiving several times as much attention. Uncle Sam needs to consult an oculist on this subject and get some magnifying spectacles adequate to enlarge this problem in his view to its real size. Thus far he has looked at the subject through the wrong end of his opera glasses.

A year ago in *E.&M.J.* some of the outstanding problems in the field of the secondary metals trade were discussed by J. W. Furness. Those concerned in the planning for minerals and metals will do well to get out that article and read it again thoughtfully. Little progress in the solution of the problems there presented is to be observed. The next Congress will have a no more important task of interest to our industries, and yet no one seems to have a real remedy to offer. Possibly the hypodermic of more facts would help all of the mineral industry more than anything

**Steering the course for a mineral policy. . . . Federal taxes may be lower rather than higher. . . . Who is to own the country's mineral resources or to what extent is the Government to participate in their exploitation? . . . Federal loans to mining. . . . Subsidies vs. valuable considerations granted to industry. . . . Protection against competition stimulated by foreign governments. . . . The lack of information on scrap and secondary metals. . . . Production control or price control?**

# Mining Executives

## Express Opinion on Some Economic Problems

**The Editor summarizes an inquiry into the attitude of leaders of the industry on policies involved in the New Deal**

IT WAS not with any expectation of finding unanimity of opinion or harmony of views on New Deal policies that *Engineering and Mining Journal* sought a mining-industry-wide expression of opinion on the issues involved in the Administration's plans and policies for industrial recovery. It was a foregone conclusion that there would be divergence of views, ranging from bitter opposition and resentment to sober criticism and general approval. We hoped, however, to elicit some constructive ideas on the future relations between the metal-mining industry and the Government, on the vexatious subject of labor, on social insurance, and on other debatable points of governmental policy that are likely to be the subjects of legislation this year.

In none of these hopes or expectations have we been disappointed. In some cases our inquiry was summarily answered with a demand that the Government let the industry alone and allow the fittest to survive. In others we received thoughtful comments on the predicament of the base metals and the necessity for cooperation with the Government in working our way out of our troubles. Naturally enough, those engaged mainly in the mining of gold sensed little need for governmental cooperation through codes or other forms of regulation. Gold producers have no problems of surplus stocks, excess capacity beyond current demand, finding an active market, or maintaining a profitable price. Hence their attitude of unconcern toward some of the real problems facing base metals, and the necessity of finding a solution that will rehabilitate and stabilize the industry.

Our inquiry was specifically directed toward the future. The objective was not to elicit criticism of the Government—there has been plenty of that, much of it merited—but to draw out and crystallize constructive proposals to supersede some of the temporary policies of the Administration. Having passed through a period of experi-

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else until the growing pains of secondary metal can be treated adequately another year.

In this connection there is one project that must be approached as a matter of policy. It relates to scrap and secondary metal in the field of strategic minerals. The scrap tin export problem which has had attention during 1934 is but one of several such policy matters. All will probably agree that using valiant effort to build up stocks of primary strategic metal in the United States and then allowing unrestricted export of secondary metal of the same type, either as scrap or more refined secondary, is an absurd economy. Congress is likely to be asked by the National Planners to correct that defect in the present mineral policy. Of course, full solution of this problem and of related questions must await the gathering of adequate facts, a task which cannot be solved immediately even if the Bureau of Mines in its new economic investigations should have unlimited funds. It will take a year or two to establish an adequate factual basis for a proper future policy, but it is not too soon to start.

Price or production control for the mineral industries has been attempted under NRA. With respect to minerals, there are many problems in common with manufacturing industry. But there are some which are peculiar and distinctive. Furthermore, the Government probably has with respect to irreplaceable mineral resources an excuse and an incentive that are lacking in the field of manufacture or merchandising.

Certainly the Government is going to have to face this question as an issue during the coming session of Congress. One proposal just lately recognized officially appears to give more promise for the mineral industries than any other. Briefly that plan is as follows:

Current reports of stocks on hand would be gathered frequently by the Government with the aid of every unit of producing and consuming industry having a material share in the metal in question. A schedule would be worked out as to the desirable size of such stocks in relation to current consumption. Whenever the ratio of stocks to prospective demand exceeded a certain figure, then it should be agreed that production control would begin.

Let us take a specific example to illustrate this philosophy. Suppose that it were agreed that the estimated six months' consumptive requirement for copper were a reasonable quantity of this metal to be kept in stock. Then at any time when the actual reported stocks were greater than this, some restriction on production would be expected. If the stocks were equal to eight months' anticipated need, then the production curtailment might be 20 per cent. If nine months' needs were in hand, a 30 per cent cut might be required, or any other appropriate set of ratios would be set up to function automatically. The philosophy is that such limitation would provide for curtailment of excess stocks without the necessity of Government or industrial agreement on prices.

Of course, those who think the laws of supply and demand can be repealed will not accept such a philosophy. However, this scheme appears in many respects to be more useful than any that has yet been tried out under NRA or than other legal plans of agreement. This scheme apparently does not require any politically unwelcome repeal of the Clayton Act or other anti-trust laws. The Government would do the statistical work and announce its findings and the industry could police the quantity of production for itself.

It may be that such a plan will work. There is some disposition to consider it seriously this winter. Congress may give it attention, possibly may authorize it specifically in the act which must be formulated if NRA is to be continued in any form after next June. In any event, some production-control plan, rather than outright price fixing, is going to be welcome in the halls of Congress, where price manipulation by industry, even with Government participation, still appears to be regarded as an unwelcome and an unwholesome idea.

mentation, we felt that experience would indicate the good features that ought to be salvaged and the bad that ought to be abandoned. This seemed to be the constructive thing to do in harmony with the President's request and the prevailing business sentiment for cooperation.

A few would discard the codes or any form of industrial control, but among producers of copper, lead, and zinc, preponderant opinion favors continuance of cooperative regulation of production. One commentator harks back to the early post-War period when futile attempts were made to stabilize the industry, confronted then as now with excessive capacity, large inventories, low demand, and subnormal prices. The adjustment of supply to demand and the reduction of inventories that were then sought with governmental cooperation are essentially the aims of the present metal codes. Hence the opinion that "the only practical solution is the permanent regulation of production to demand."

Another metal-mining executive feels that "codes or similar agreements are necessary for a while longer. Production control is needed, without permitting restraint of trade or constructive monopoly to raise prices to the consumer above a reasonable level." Still another: "There should be an extension of NIRA under some modified form, providing that codes be prepared by the industries. Production control to the extent of permitting industry to keep production in step with consumption is sound, and is the only control provision that should be embodied in the codes."

### Opinion as to Price Control Is Variable

There is divergence of opinion on the immediate need of price control of metals. In the long run it is agreed that reasonable prices can be maintained by adjusting supply to demand, particularly if inventories are normal. In the face of abnormally large stocks and of productive capacity in excess of demand, a fixed price for a metal may find temporary justification as an expedient to meet an extraordinary condition. One executive believes that "price control within reasonable limits is necessary for a while longer. This control must take into account cost of production of efficient members of the industry as a whole, due consideration being given to the fact that many producers can never produce at a profit, and prices cannot be held up merely to keep them in business which they are not capable of conducting efficiently, and to the detriment of the consumer. Price control should extend only to the prevention of cut-throat competition."

"Fixed prices should not be incorporated" as a control provision in codes, says another. "I see no objection, however, to having all prices filed with a central agency and made available to the industry. This method would eliminate some of the cut-throat competition that prevails from time to time in the nonferrous metals, and would leave price fluctuation more or less in accord with supply and demand."

In contrast to these comments favoring some form of production control as a measure of stabilization are those recommending a hands-off policy that would give full sway to rugged individualism. There are those who see no need of planning of any kind and who resent what they term interference with their business.

The answer, obviously, of the advocates of control is that the natural-resource industries, of which metal mining is an example, have quite different characteristics from the manufacturing industries and are not only entitled to special treatment but require it if they are to have a stable and prosperous existence. This view is held outside as

**ROBERT E. TALLY**

*Vice-President,*
*United Verde Copper Company*

**"I believe in the permanent regulation of production to demand in the overdeveloped natural-resource industries, but with a very minimum of governmental regulation."**

●

**HOWARD I. YOUNG**

*President,*
*American Zinc, Lead & Smelting Company*

**"Production control to the extent of permitting industry to keep production in step with consumption is, in my opinion, sound, and is the only control provision that should be embodied in codes."**

●

**A. E. BENDELARI**

*President,*
*The Eagle-Picher Lead Company*

**"Codes or some similar agreements are necessary for a while longer. Production control somewhat along the lines of the proposed zinc code are needed."**

●

well as within the mining industry, and has been the basis for unsuccessful efforts in the past to relax the provisions of the anti-trust laws with respect to industries exploiting natural resources—all in the interest of orderly production and conservation.

The theory of the survival of the fittest, however well it may apply to manufactures, unfortunately does not function in the natural-resource industries. Applied to base-metal mining it is likely to result in production in excess of market demand until prices decline to a point unprofitable for all, and force the higher-cost producers to cease operations. "It is therefore probable," argues one executive, "that this industry will require governmental cooperation, with a minimum of regulation, for some years." Nor is governmental cooperation enough. There must be cooperation among the units of the industry if it is to return to prosperity. Hence cooperation through code control, coupled with oversight by the government, is deemed desirable.

There is practically unanimous opinion among our commentators that minimum wages and maximum hours are not proper subjects for national legislation. At the same time the conviction is expressed that "sweat-shop" conditions should not be allowed to exist. "There should be no permanent legislation fixing maximum hours and minimum wages," says one executive. "The extension of NIRA to permit the continuance of codes is far more desirable. A law fixing maximum hours would lead to a lot of bootlegging between employer and employee, and would also tend to increase the cost of living and the cost of all commodities to a point higher than our present purchasing power can absorb. Codes should provide for hours and wages, but should be flexible enough so that hours can be increased or decreased as the demand for metals justifies." Another thinks it desirable to fix maximum hours and minimum wages (possibly through codes) "applying to all employers and employees similarly situated." Western sentiment is opposed to any enactment of federal legislation on this subject, maintaining that it is rather a matter for negotiation within an industry or region.

Here is a topic on which our commentators have vigorous, harmonious and, on the whole, fair and constructive views. Organization of labor by groups is acceptable and desirable, especially where the number employed is too large for individual dealing. But there is insistence that no form of organization be forced on the industry as a whole and that workers be free to select and adopt their own means of collective action. Says one executive: "There must be absolute neutrality with regard to organized labor and company union, neither being fostered by the Government." Another view: "Section 7-A should be modified so that it will prohibit coercion of employees, either by the employer or by organized labor, leaving it entirely optional for employees to organize through company unions, plant workmen's groups, or organized labor, as they choose. And the employer should recognize representatives of such groups that are organized in his plant. He should, not, on the other hand, be forced to operate a closed shop nor collect union dues."

## SUMMARY

**Thoughtful opinion in the mining industry on economic problems confronting it in 1935 seems to favor:**

**Production control of base metals through extension of a modified NIRA. Price control only as a temporary expedient to meet an extraordinary condition.**

**Special consideration for economic control of natural-resource industries in the public interest.**

**No national legislation on hours and wages. Control of these items through codes.**

**Freedom of labor to organize as it prefers without coercion by employers or labor groups.**

**Liability of organized labor for its acts.**

**Collective bargaining. Mediation and arbitration of disputes before strikes and lock-outs.**

**Unemployment insurance and old-age pensions.**

There is some sentiment in favor of company or regional organizations as being more satisfactory in the long run. And there is a definite feeling that organized labor as now constituted should be made more responsible for its acts. "Labor has been the beneficiary of much legislation," writes one executive, "and in all fairness it should also be legislated into the position of a legal entity responsible under the law for its acts, just as corporations are legally responsibile for theirs." Again: "There should be legislation which would require unions of every kind whatever to incorporate so there will be legal responsibility and liability for their acts."

On the subject of mediation and arbitration the definite view is expressed that "means should be provided for mediation and arbitration prior to legal action in case of dispute, and strikes and lockouts outlawed until these processes have been exhausted." Incidentally, these are the basic principles on which the Butte strike was settled last September when an agreement was reached on labor relations in that district. (*Engineering and Mining Journal,* October, 1934, pp. 436-37.)

This is a subject that brings diverse reactions from leaders in the mining industry. Arguing from the premise that "as compensation insurance was finally worked out by each State in the interest of its own citizens and industries," one commentator feels that "social insurance can best be settled by the States themselves." Support of this view is found in the "results of federal operation of the Eighteenth Amendment and in the grievously handled matter of war veterans' legislation."

Preponderant opinion, however, among those who responded to our inquiry is summed up in the statement that "the average mining company has a broad-minded and liberal attitude on providing employment or pensions for its old-time and efficient employees, and national legislation toward this end, if on a sound basis, without political influence, is not necessarily objectionable."

Distrust of the present methods of unemployment relief, with distribution of moneys under political control, leads one executive to declare that "if the present method of local, state, and federal aid cannot be improved upon, then I am in favor of unemployment insurance." A similar view is that "there should be unemployment insurance for a very limited period, contributed to by both employer and employee while the latter is employed, in preference to a national dole."

Old-age pensions find favor, although one view is that they are clearly uneconomic when levied on industry and labor. Majority opinion, however, is summed up in one statement to the effect that "national or state legislation is desirable for old-age pensions," without making any attempt to discuss the varied details of such a complex subject as this.

In concluding this summary of thought and opinion as expressed by representative leaders in the mining industry, we again call attention to the fact that personal views are undoubtedly influenced by past experience and by the kind of mining in which the operator is engaged. On the whole it may be said that there is a liberal, realistic, and constructive attitude toward some of the industry's economic problems covered by our inquiry.

# Research

## In Non-ferrous Metallurgy Is Productive Of Results

**Investigators in many lines have been busy—Work hampered by insufficient funds**

THE fruit of technical research has no season for ripening, but matures throughout the year at such time as the ability of the researcher, helped or hindered by the vagaries of fortune, including appropriations, may ordain. A glimpse of the situation at any moment reveals the new successes prominent against the background of hard work that made them possible and that yet may be productive of other useful and interesting results.

In the field of non-ferrous metallurgy, this term being used broadly to include all phases of mineral dressing and reduction to an intermediate or final product, research programs for some time past have been stunted and curtailed, in many cases because of the failure of the usual sponsors to provide the financial nourishment needed for their well-being. This seems to have been less pronounced in the case of some educational institutions than in others, and indeed the laboratories of certain commercial establishments, as well as of the federal Bureau of Mines, appear to have been active despite difficulties of the times.

Activity has been marked in the Metallurgical Division of the Bureau, which conducts research in all phases of ore treatment. This research is directed from the office of the Chief Engineer of the Division in Washington and is carried on in part in cooperation with the Universities of California, Nevada, Utah, Missouri, Minnesota, and Arizona.

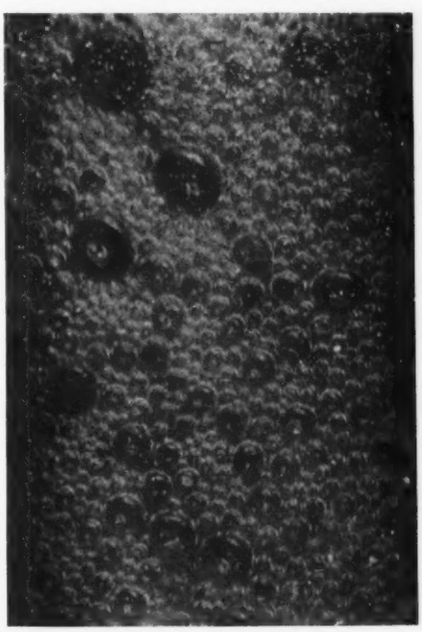
In spite of the curtailment of its appropriations and staff, the Bureau has continued its fundamental investigations at almost full strength. These come under two general heads: thermodynamic studies, which serve as a basis for new metallurgical developments both within the Bureau and outside of it; and mineral physics studies, which afford basic information necessary for any advance in ore dressing.

In the field of thermodynamics, the Bureau has published a second member of a series of contributions to theoretical metallurgy in which is given a critical compilation of specific heats at high temperatures of 300 metals and inorganic compounds. This is a companion to the previously published bulletin on entropies. A bulletin on vapor pressures is in press. A survey of the thermodynamic properties of manganese and its compounds also has been published. Current work in this field includes studies on free energies of chromium compounds and studies of carbonates. The Bureau's thermodynamic laboratory is the only one in the United States devoted to measuring the thermodynamic properties of materials interesting to metallurgists. In the last six years measurements have been made on 59 important substances in this class.

In the application of this fundamental work the study of methane reduction of zinc has been completed and the results have been published. This method has been exhaustively proved in the laboratory and is ready for industrial development when economic conditions permit. A companion process for the reduction of iron ores has been installed in a pilot plant at Martinez, Calif. A method for separating cadmium from zinc based on thermodynamic studies has also been described.

In the field of mineral physics, the Bureau has been pioneering. Studies of the structure of minerals and the fundamental nature of crushing and grinding have led to explosive shattering as a method of ore preparation. This method depends upon the condensation on the mineral grains of a film of water which is superheated and exploded by sudden release of pressure. Laboratory studies not yet published indicate that by a revision of the technique previously described, grinding may be accomplished at surprisingly low power cost, with the additional advantage of less fines.

**A bubble column in a flotation cell**



The study of magnetic properties of minerals has been particularly rewarding. The researchers have found it possible to alter these properties greatly in many minerals by appropriate heat-treatment. A new type of magnetic separator has been invented and described in which the repulsion of the minerals in an alternating magnetic field is utilized rather than the usual attraction. High capacities without entrainment are indicated. Among the non-ferrous ores which have been successfully treated thus are those of chromium, tungsten, titanium, cobalt, and copper. One of the byproducts of this magnetic study has been the discovery of an important fundamental relation between the surface of a magnetic powder and its coercive force. This relation is not only of great interest as regards magnetic theory but is useful as a direct method of measuring the surface of powders without sizing and also promises to be important in the study of structures of minerals and alloys.

The study of electrical properties of minerals, though less advanced than the magnetic study, has nevertheless cleared up various disagreements regarding mineral structure and has resulted in a new type of electrostatic separation which promises to increase the scope of this method.

Finally, in the field of surface chemistry, the development of new reagents has made possible the extension of flotation to an increasing number of non-sulphide ores.

Also fundamental in its nature is the study of the theory of flotation, which, according to W. Spencer Hutchinson, has been made recently at Massachusetts Institute of Technology. This work consists in the direct measurement by means of a special apparatus of the forces holding the air bubbles to sulphide mineral particles in froth flotation.

Under the conditions existing today, as well as during the past year or more, one might naturally expect to find that

much attention was being devoted to problems of gold and silver extraction. This is indeed the case. The present prosperity of the gold-mining industry has stimulated much activity of this nature, not only in the laboratories of schools and colleges but also in those of commercial establishments.

For the past two years, the research laboratory of the American Cyanamid Company has been giving some time to the study of what it terms cyanidation fundamentals. It was the opinion of the company's late chief technologist, G. H. Buchanan, that although cyanidation is an old and standardized process, a systematic research into its fundamentals might disclose something of practical value. The results of the work done to date will be presented at the February meeting of the American Institute of Mining and Metallurgical Engineers, in New York. The first part of the paper will deal with certain thermodynamic considerations that indicate which of the various equations proposed for the reaction of cyanide with gold and silver can theoretically take place. The second part will deal with such factors as the relationship between the cyanide concentration and the rate of dissolution of gold and silver in cyanide, and the effect of alkalinity. The company plans to continue these researches and to investigate the effect of various soluble salts on the rate of dissolution of gold and silver in cyanide. Later, it hopes to study the fundamentals of precipitation in a manner similar to the conduct of the study made on dissolution.

Over a year ago, research was started on cyanidation at the University of Arizona, according to T. G. Chapman. The problem was divided into two parts. The first had for its objective the rapid dissolution of gold and silver, utilizing a mechanical type of flotation machine to replace the usual agitator. The second was directed toward the recovery of gold and silver from the ore pulp with a precipitated or absorbing action, followed by flotation. Promising results are said to have been obtained. At present, the work along these two lines has been combined in an attempt to develop a continuous process based on the principles outlined.

Of present importance is the matter of treating refractory gold ores and tailings. The flotation of gold ores in general is receiving particular attention from the United States Bureau of Mines, and several investigations on both ores and tailings from many different localities are being made. Much definite information as to the influence of various promoters and depressors in the flotation circuits has been collected.

This steady increase in the use of flotation for treating precious-metal ores has introduced many problems in connection with the cyaniding of flotation concentrates. Researchers of the American Cyanamid operations have had to deal with many difficulties in this respect. As stated by S. J. Swainson, they have been able to draw some general conclusions which are more or less applicable to the majority of concentrates, despite the fact that each concentrate presents a separate problem in itself. According to Mr. Swainson, the most important fact that they have learned is that in cyaniding precious-metal concentrates the cyanide consumption is materially reduced, and the precious-metal extraction usually improved, if the concentrates are given a preliminary aëration with lime after grinding and before the addition of cyanide. This aëration converts the "-ous" salts which are formed in grinding to the "-ic" state, in which they do not consume cyanide and oxygen during cyanidation. This is said to be particularly true of concentrates containing much pyrite and pyrrhotite.

Likewise, at Massachusetts Institute of Technology, considerable attention has been directed to this timely subject of concentrating the various types of gold ores. Phases considered include the floatability of gold particles of different shapes; also the flotation of oxidized gold ores, and the treatment of carbonaceous gold ore.

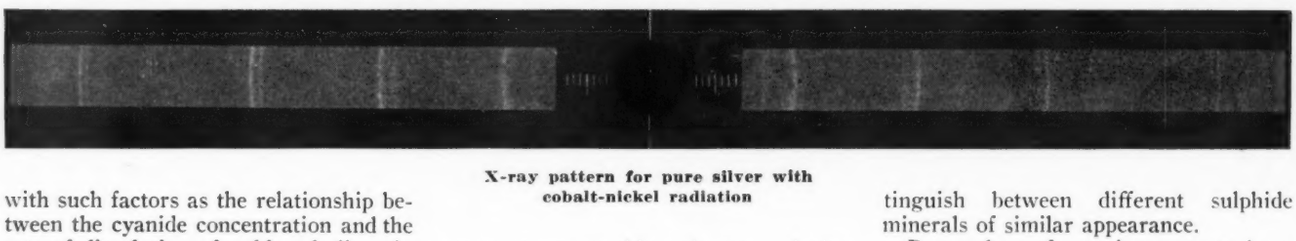
Recovery of gold from black sands and from alluvial materials in general has been studied at the University of California, according to Ernest A. Hersam. Some of the older practices have been checked and certain of them have been refined and improved. Similarly, at the Montana School of Mines, in Butte, the recovery of placer gold is being investigated.

Amalgamation during the fine grinding of gold ores has been the subject of considerable experimental work by the United States Bureau of Mines, and the influence of various concomitants on gold extraction and mercury losses has been determined.

Other studies besides that of the recovery of placer gold have been conducted at Butte, according to A. M. Gaudin. In floating manganese carbonate ores, success has been obtained in reducing the cost of reagents. The flotation of sulphide particles of colloidal size has also been carried out. At present two other investigations are under way: one into the fundamentals of the action of xanthates and related substances on sulphide minerals; the other into the chemistry of xanthates and dixanthogens.

Organic chemicals with extreme hydrophile-unbalance have been applied successfully in flotation by the United States Bureau of Mines. R. S. Dean states that these reagents have also permitted a revival of agglomeration and separation by other methods, such as tabling or magnetic separation (the modified Murex process). To illustrate this, Mr. Dean points out that hematite iron ores have been agglomerated successfully with a small amount of added magnetite by means of paraffin oil emulsions. This done, the entire iron content of the ore may then be separated magnetically from the silica.

Of bearing on flotation work is the use that is being made of differential iridescent staining at the Montana School of Mines by Gaudin to distinguish between different sulphide minerals of similar appearance.



**X-ray pattern for pure silver with cobalt-nickel radiation**

Researches of varying extent have also been conducted at the laboratories of certain other schools, including the University of Pittsburgh and the University of California, as well as the Colorado School of Mines. At the last-named, this work has been directed especially to flotation of non-metallics.

Beneficiation of non-metallic minerals has also received attention at the Battelle Memorial Institute, at Columbus, Ohio. Here, according to Clyde E. Williams, considerable investigative work has been done on the dressing of refractory raw materials and ceramic materials, with the objective of applying methods of concentration to improving their grade.

Non-metallic flotation has been studied in the ore-dressing laboratory of the American Cyanamid Company also. Last summer that company's subsidiary, the Amalgamated Phosphate Company, built a 3,000-ton flotation plant for treating Florida pebble-rock fines at its Green Bay location. This plant works under license from the Phosphate Recovery Corporation. A Fagergren flotation machine of a special square type was developed for this work and is now in use in two of the larger phosphate-rock flotation plants in the pebble-rock field.

Another problem of similar nature, in the solution of which the same com-

pany's ore-dressing staff has assisted, is the flotation of calcium carbonate from cement rock. This problem was brought to the staff by a cement plant near Philadelphia. As a result of the laboratory work that ensued, a pilot plant was installed and subsequently a full-scale flotation plant was erected for treating 500 tons of cement slurry per day. Operating results have confirmed those obtained in the laboratory and the pilot plant in every detail. In connection with this process, the rate of flotation makes it possible to quarry a cement rock which is not of suitable composition for cement manufacture and from it to make any type of cement desired.

Emphasis has been placed on flotation in beneficiation work conducted by the University of Kentucky College of Engineering on central Kentucky barytes, in an effort to effect a separation of the contained galena and sphalerite. Thus far this problem has been attacked entirely from the viewpoint of ore dressing, using a ball mill followed by tabling, but with the emphasis, as stated, on flotation.

lead bullions could be electrolyzed in a fluosilicate solution, but only at very low current densities, with the production of impure cathode lead and with the consumption of excessive amounts of fluosilicic acid. The tests made indicated that extremely pure cathode lead could be produced with very low acid consumption when two modifications of the usual Betts practice were observed. These were:

(a) Control of the time of corrosion of the anodes.

(b) Washing of the anode slime by a counter-current system of dip washing while the slime is still in place on the scrap anodes.

The further development was made that, as the time of corrosion for a given anode consumption was lengthened, the thickness of the slime blanket on the anode increased and that the electrical resistance of this slime blanket increased correspondingly. Measurements of the voltage drop across the slime blanket on the face of the anode, when using 15 amp. per square foot of anode surface, showed a critical value of between 0.15 and 0.20 volts.

The average acid consumption has been less than 5 lb. of 100 per cent $H_2SiF_6$ per ton of refined lead produced. United States Patent 1,913,985 has been granted to T. E. Harper, Jr., and Gustave Reinberg.

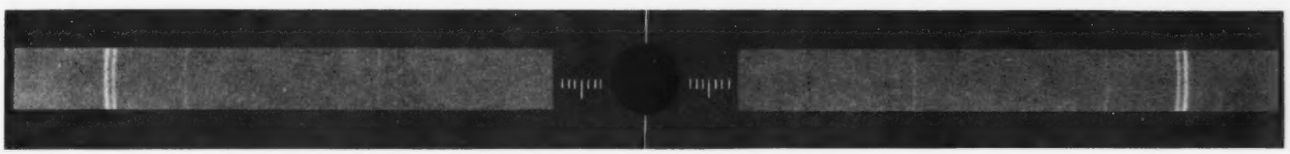
Experiments to develop a method for separating lead from sulphur in galena without the usual roasting, sintering, and smelting practices have been conducted at the Massachusetts Institute of Technology over a period of several years. W. Spencer Hutchinson reports that various procedures, such as electrolysis, metathesis, and decomposition by gases, have been attempted. Little success has been attained to date, he says, despite which further investigations are felt to be warranted.

After investigating lead blast-furnace smelting for several years, the Metallurgical Division of the United States Bureau of Mines has finally summarized its work in a progress report. Hope is expressed that the detailed studies can be published at an early date.

In the field of copper metallurgy the possibilities of flash roasting and, in particular, the nature of the copper ferrites formed have been investigated by the Metallurgical Division of the Bureau. According to R. S. Dean, the identification of two definite forms of cupric ferrite has cleared up many discrepancies in regard to the reported properties of this material. This work is being continued, with the ultimate aim of finding ways and means of saving not only copper, but iron and sulphur as well, in the treatment of copper ores.

The University of Arizona has been cooperating with the federal Bureau in this study of the characteristics of flash roasting, particularly as applied to flotation concentrates. T. G. Chapman reports that its effort has been directed toward discovering the fundamental conditions desirable for a complete reaction in the operation. It, too, has directed its attention to seeking methods for decomposing copper ferrites. This work is still in active progress. A report of the first part of it is to be found in Technical Publication 514 of the American Institute of Mining and Metallurgical Engineers.

Considerable research in the metallurgy of zinc has been carried on by the technical department of the New Jersey Zinc Company. The nature of



**X-ray pattern for pure molybdenum with copper radiation**

Electrometallurgical research has yielded some interesting results. Work on the development of insoluble or passive anodes for non-ferrous electrolytes has been done at the Columbia School of Mines by Edward F. Kern and E. N. Morrill. It is still under way. Experimentation is being made in the field of electrolytic precipitation at the Colorado School of Mines, according to Dr. Coolbaugh. At the Montana School of Mines, according to A. M. Gaudin, researches have been conducted in three directions, in only one of which is the work complete; namely, in the production of metallic chromium from chromium oxide. Studies still under way are directed to the recovery of zinc from the ammonium sulphate leaching of zinc calcines, and, secondly, to the ferrous-ferric iron ratio in the electrolysis of copper.

The leaching of raw chalcopyrite with hot and cold ferric salts in several types of apparatus has been begun at the Massachusetts Institute of Technology, according to Professor Hutchinson. The results to date have been marked with only moderate success.

Improvement of the Betts process by the research department of the Cerro de Pasco Copper Corporation at Oroya, Peru, so as to permit the economical and commercial treatment of very impure lead bullions, is reported by Gustave Reinberg. This work was started in 1930. It was known that very impure

Below this critical value, cathode lead of excellent quality resulted; above the critical value impure cathode lead was produced. The critical slime voltage was constant (0.15 to 0.20 volts for anodes of widely different composition). The work disclosed that anodes containing 90 per cent lead can be electrolyzed at 15 amp. per square foot for about 100 hours before the slime voltage reaches 0.2 volts, and anodes containing 80 per cent lead can be electrolyzed about 50 hours before the critical voltage is reached.

These laboratory experiments demonstrated that lower acid consumption resulted when the slime was washed by a dip method while still on the anode than when washed after removal from the scrap anodes.

Two full-sized tanks were then built and operated for more than a year on anodes of wide range in composition. The results obtained checked those of the laboratory, so decision was made to build a commercial plant. This was erected and began operation in July, 1934. To date the results have been above expectations. Typical analyses of anodes, refined lead, and anode slime are:

| | Ag Oz. per Ton | Pb % | Cu % | Sb % | As % | Bi % |
|---|---|---|---|---|---|---|
| Anodes ..... | 6.0 | 92.10 | 0.15 | 6.00 | 1.50 | 0.23 |
| Refined lead .... | 0.0005 | 99.998 | 0.0002 | 0.0007 | 0.00004 | 0.0004 |
| Anode slime ..... | 88.60 | 19.20 | 1.00 | 49.60 | 9.80 | 1.65 |

# Industrial Markets Developing

*B. H. Strom*

*Metallurgist,*
*New York*

FORCED by the exacting demands of modern industry, the metallurgist is constantly on the lookout for new methods of perfecting his products. The effect of even minute quantities of some rare metals on the physical or chemical properties of a metal or an alloy is becoming better known, as is evidenced, for instance, by the addition of tellurium to lead or lithium to bearing metals. Thus the metallurgist is confronted with the twofold task of producing metals of highest purity, and of compounding these metals with the proper alloying constituents to obtain the properties specified by the engineer.

In reviewing the metallurgical achievements of the past decade two outstanding accomplishments may be noted—the stainless irons and steels, and the high-quality cast irons; for the successful development of both of these much credit must be given to the workers in the rare-metal field. The development of high-speed steels, cutting tools, and cemented carbides—based entirely on the rare metals—has revolutionized the machine industry and made possible modern mass production; the electric industry, radio technique, and electronics are other beneficiaries.

It is therefore no wonder that the interest in the metallurgy of the rare metals is on the increase. Many of these metals, moreover, are really not rare, in the sense of the word, and cheaper production methods may elevate some of them to rank among the major metals. A tangible proof of this growing interest was the devotion of an entire session to this subject at the last fall meeting of the Electrochemical Society. The Bureau of Mines is also giving increased attention to their development, as is revealed by the excellent reviews in the latest Minerals Yearbook.

With copper-refining capacity cut to some of the investigations cannot yet be disclosed, because patent applications are under consideration. Aside from these restrictions, F. N. Spencer, vice-president of the company, reports investigations along three lines; namely, reductibility, briquetting, and the use of the Waelz kiln.

With respect to the first of these three, a laboratory method has been developed for evaluating the reduction characteristics of a zinc ore. The properties measured are the temperature of reduction, the rate of reaction of a zinc ore with coal, and the fusion temperature of the residue. These tests are said to be useful in predicating the effect on commercial performance of changes in either the chemical or the physical properties of the ore or coal.

In its study of briquetting, the technical department has thoroughly investigated by laboratory tests the effect of particle size and size distribution of the ingredients on the charge preparation and briquet strength, both green and dry.

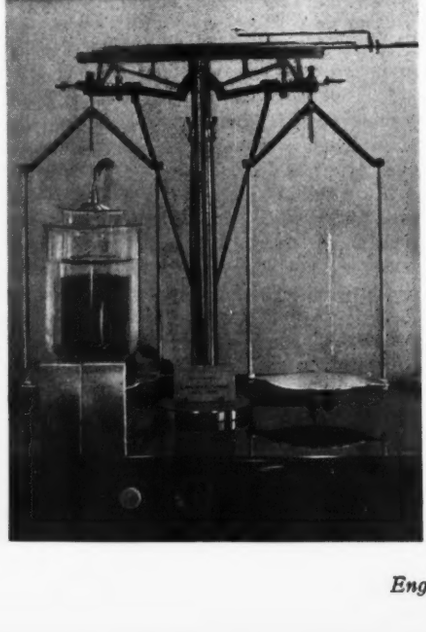
The laboratory investigation of the suitability of various low-grade ores and various classes of fuels for use in the Waelz kiln has been made in an attempt to choose the most suitable combination for commercial work.

Miscellaneous other researches include that made at the Battelle Memorial Institute on the problem of recovering pyrite from washery refuse for the manufacture of sulphuric acid, according to Mr. Williams. Another investigation, in which the possibilities of treating the oxidized ores of silver were studied at the University of California, is reported by Professor Hersam.

Various problems in the field of physical metallurgy have attracted researchers. Special study of silver as an alloy component of aluminum has been made at the University of California, according to Professor Hersam. At the same institution, a research has been conducted on the aluminum alloys of the magnalium type, showing the influence of small amounts of silicon, copper, and iron on the corrosion resistance of the alloy, with a view to extending the serviceability and employment of these light alloys in certain applications.

In the metallurgical laboratories of the School of Mines at Columbia University, further work has been done in investigating the use of metal powders in the production of ferrous and non-ferrous alloys. In this activity E. F. Kern, Charles Hardy, and F. V. Lenel have participated. Dr. Kern has also been working with tarnish-resisting silver alloys. K. M. Simpson and R. T. Banister have been engaged on the development of commercial copper-iron alloys. Several other studies of various alloys, somewhat without the scope of this paper, have been made by various members of the staff, and at present a series of X-ray studies are being conducted by graduate students under Professor Jette's supervision.

**One of the working tools of the researcher**



At Butte, a study of the dispersion hardening of copper by the addition of manganese silicide is being made at the Montana School of Mines; likewise a study of metallic indium is under way at the same institution.

In conclusion, it may be interesting to note that during the past year a change was made in the method of publishing the current investigations of the Metallurgical Division of the United States Bureau of Mines. Instead of publishing random reports of investigations, the work has been correlated in a series of nine Progress Reports covering, respectively: 1, Mineral physics studies; 2, Gold-recovery studies; 3, Studies in the metallurgy of copper; 4, Studies in direct production of iron and steel from ore; 5, Ore-dressing studies; 6, Size preparation of iron ores and desulphurization studies; 7, Studies in lead metallurgy; 8, Studies in zinc metallurgy; 9, Thermodynamic data on some metallurgically important compounds of lead and the antimony group of metals and their applications. This systematizing of the release of technical information will doubtless be found of advantage in various ways. In addition, the Bureau has been able to publish a small edition of a very comprehensive bulletin covering its manganese investigations, which is now out of print.

# For Uncommon Metals and Alloys

a minimum, the increased consumption of selenium has completely absorbed all stocks in the hands of the producers and placed the consumers on a hand-to-mouth basis. Two important new producers, The Canadian Copper Refiners, at Montreal East, and Boliden, at Rönnskär, Sweden, both of which are working slimes of unusually high selenium content, must be figured into the picture of future supplies. How the situation would be with the copper refineries working at normal capacity is a matter of conjecture, although it is reasonable to assume that the increased production by the newcomers in the field, plus the added recovery resulting from better treatment methods, would at least balance the extra demand created by new uses.

The greatest tonnage of selenium and its salts is absorbed by the glass industry, in which it is rapidly replacing manganese dioxide as a decolorizer. It is also used to produce ruby glass for traffic signals. Addition of some cadmium sulphide gives a very intense ruby; and the production of glass in pink, orange, and amber colors is made possible by inclusion of materials such as uranium salts or borax with the selenium, frequently under properly controlled oxidizing conditions. Colored glazes and enamels are also obtainable by proper additions of selenium.

For several years the rubber industry has taken an important tonnage of selenium for compounding, to increase tensile strength and resistance to abrasion, and to shorten cure and improve aging. A thin coat of selenium powder on an adhesive base has been found an effective means of flame-proofing insulated wire. Last year tellurium proved to be far superior to selenium for both these purposes.

Addition of 0.25 per cent selenium to stainless steels greatly improves their free-cutting properties, giving a tougher material than the corresponding high-sulphur steels, and one more easily cold-worked. With the increasing importance of these steels, this application should expand. An iron-selenium alloy, produced by American Smelting & Refining Company, has been developed for this purpose. Selenium has also been found to be an effective insecticide, particularly for exterminating the red spider, which each year causes millions of dollars' damage in the Western fruit orchards. In view of the fact that recent investigations have disclosed that minute contents of selenium in the native soils of many of our Western states are responsible for certain diseases of cattle, such as "alkali disease" and "blind staggers," it is evident that use of selenium in this field must be thoroughly tested and that every precaution must be taken should this application materialize. The use of selenium in photoelectric cells, although faced with much competition from other materials, should be stimulated by the recent introduction of a new cell, the "photronic" cell, for which many advantages are claimed.

As mentioned in the foregoing, tellurium is also being used in the compounding of rubber. But the addition of tellurium to lead may possibly be of still greater importance. With these two developments tellurium has finally gained admittance among the useful elements, with the estimated consumption for 1934 approximating 20,000 lb. Formerly the only commercial application was its use in the purification of zinc sulphate solutions, prior to electrolysis.

Tellurium lead, with 0.02 to 0.1 per cent Te, sometimes in combination with other alloying elements, has now definitely reached the commercial stage. It has a remarkable strength and corrosion resistance compared with pure lead, and this superiority is accentuated with increasing temperature. The alloy has a fine structure, and grain growth is practically absent; it possesses great creep strength and high resistance to fatigue and vibration, is substantially toughened by work-hardening, and it may be burned and welded like ordinary lead. Pipes of this material show an extraordinary resistance to bursting from freezing.

**These so-called "rare" materials are being produced in greater abundance, either direct from their ores or as byproducts from the refinery. As elements or alloys they possess properties that suggest new uses**

Rhenium, another metal occasionally present in copper refinery slimes, and produced by Vereinigte Chemische Fabriken zu Leopoldshall, has now reached an annual production of over 300 lb., and the resulting drop in price has placed it within the bounds of commercial application. Fink and Deren, of Columbia University, have recently announced a successful method of plating this metal. The deposit is of a pleasing color, very hard (harder than rhodium), and it has a remarkable resistance to hydrochloric acid, only slightly exceeded by that of chromium plate. It is remarkably free from pinholes and may find application where a surface of high and constant reflectivity is required. Another promising application is the deposition on tungsten filament, to impart long life and high resistance to residual gases.

Gallium, which like rhenium occurs in the Mansfeld copper shale, is also produced at Leopoldshall and is available in a quantity exceeding 100 lb. annually. This metal is also found in zinc blendes. It is expected to find use as a substitute for mercury in dental amalgams and in the electric field, and its high reflectivity may lead to scientific uses. Other interesting properties that may be utilized are the ability to emit electrons at lower temperature than any other metal, and the long liquid range, from 30 to 2,000 deg. C., which may be useful in thermometry.

Among the byproducts in zinc reduction cadmium holds the most important position. The excellent rust-proofing properties of cadmium plate have provided an important outlet, particularly in the automotive field, and are responsible for the good position of the metal today. Interesting late developments are the use of cadmium as a constituent element in alloys for crankshaft bearings, and the cadmium-antimony-lead alloys of British Non-Ferrous Metals Research Association. The latter, which have great strength and high resistance to vibration, may meet some competition from the new tellurium alloys, particularly as they do not possess any greater corrosion resistance than ordinary lead. At least two new cadmium alloys are undergoing tests in bearings for high-speed internal-combustion motors. In one case cadmium is alloyed with silver; in the other with nickel. It is understood that this development work has been undertaken not merely to find a substitute for lead-tin bearing metals, but to produce a material giving high efficiency for the purpose specified.

Indium, another byproduct of the zinc industry, is now being produced in pound lots by Grasselli and Anaconda, and a sufficient supply is available should the demand be created. Much activity has been displayed in this metal during recent years, and a satisfactory method of plating has been developed by D. Gray, of the Indium Corporation of America. A hard, tarnish-resistant surface is obtained, which is finding application in the stabilization of the surface of reflectors. In addition, some of the metal is used in dental alloys, and work is being carried on to utilize it in the production of non-tarnishing silver. Other uses may be expected as its properties become better known.

Except for minor applications, mainly for medicinal purposes, no commercial

uses have yet been developed for germanium, although many tons a year may be recovered annually from purification residues produced in zinc-leaching operations.

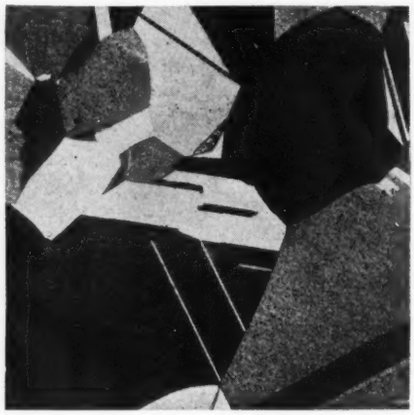
### New Industrial Uses for Bismuth

Although almost three-fourths of the world's production of bismuth is still being consumed in the manufacture of astringents and antiseptic powders, attempts to increase the industrial applications have met with a good deal of success during the last five years. First in importance comes the production of non-shrinking alloys of low melting point, finding application in sprinkler heads and fire-door releases, safety plugs, dental models, and holders. Numerous alloys with lead and tin with melting points ranging from 70 to 330 deg. C. are used to produce tight joints between metal and glass, and as fillers in the bending of thin-walled metal tubing. Low-melting alloys are also used as liquid seal in nitriding and annealing furnaces, for heat-treatment baths, master castings, and proof castings. A hard, non-shrinking alloy has found extensive use for mounting parts of compound dies, punches, jigs, and fixtures. Most bismuth is obtained as byproduct in lead refining. Lately, however, Boliden, a gold-copper smelter, has been added to the important producers.

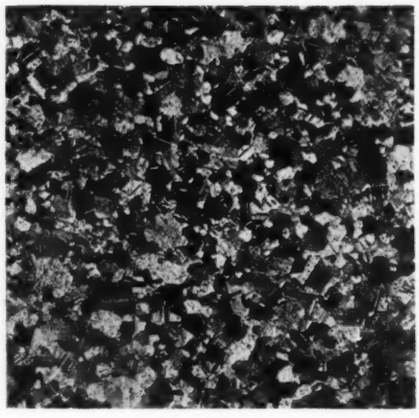
Until recently the main source of thallium was flue dust obtained in roasting pyrites. Lately the recovery from zinc blende, as a byproduct in zinc and lead metallurgy, has opened a new source of supply. Its most important use is as exterminator of rodents. Care in handling must be exercised, on account of its highly toxic properties. Alloys with silver are characterized by high luster. Lead-base bearing metals may be improved by addition of some thallium, and other lead-thallium alloys may find application in electric fuses. Other suggested uses are in low-temperature thermometry and in pigments.

The platinum metals, important byproducts in nickel refining, and produced in small quantities in the refining of copper and lead, are finding increasing use in jewelry, due to the drastic drop in price some years ago, and to the late increase in the value of gold. Platinum, ranking first in importance, is also used extensively by the chemical industry, in equipment and apparatus, and in catalysts. Palladium is now making inroads in dentistry, replacing gold in dental alloys; it is also used widely in jewelry. The third of the group, iridium, is mainly used alloyed with platinum, to impart greater hardness. Osmium, ruthenium, and rhodium are of minor importance, although rhodium has found some use recently in protecting silver from tarnishing.

The most important outlets for metallic cobalt are the stellite alloys, used mainly for hard-facing surfaces, exposed to extreme wear and abrasion. It has also an important use as binder for tungsten carbide and other hard cutting materials, and it is an important constituent in magnetic alloys. Canada, formerly the important producer, has lately been overshadowed by Africa, where cobalt is produced by the Katanga and Rhokana companies, and more recently in Morocco. Although the Sudbury nickel ores contain an appreciable tonnage of cobalt, the present process does not offer any possibility of its recovery.



**The effect of adding a small amount of nickel to beryllium-copper is shown by the two cuts on this page. This photomicrograph shows a binary beryllium-copper alloy containing 2 per cent beryllium and no nickel. Compare the grain size with that below. Magnified 75X**



**In contrast with the above, this photomicrograph shows Anaconda beryllium-copper containing 2 to 2.25 per cent beryllium and 0.25 to 0.50 per cent nickel. The reduction in grain size is said to be accompanied by a definite improvement in the alloy's characteristics. Magnified 75X.**

### Beryllium Imparts New Properties To Copper

Great hopes were held out for the future of beryllium alloys some years ago. Although these expectations cannot be said to have been fully realized, important progress has been made. Strangely enough, this progress has not been along the line first anticipated—the development of high-strength, light alloys—as, so far, the copper alloys have held the center of the stage. The important properties of these are a great hardness and tensile strength, 350-400 Brinell and 150,000-180,000 lb./sq.in., respectively. This is accomplished with a beryllium content of only about 2 per cent; in fact, beryllium is said to have the same effect on copper as carbon has on iron.

In addition, these bronzes possess an unusually high fatigue resistance, high electric conductivity, and they are easily cut and cold-worked prior to hardening. Castings, drop forgings, and various wrought and rolled forms are available. An interesting use is in non-sparking tools, cold chisels, paint scrapers, saws, drills, and wrenches. Other applications include airplane propellers, relay parts, contact clips, thermostat controls, breaker points, springs, heavy-duty bearings, valve guides, and parts for internal-combustion engines.

Intense research is also carried out, here and abroad, to develop other alloys. Nickel-beryllium alloys said to combine strength and hardness with high elasticity have been used in high-temperature springs and surgical instruments. In Germany a special non-magnetic and rust-proof alloy has been developed for balance wheels in watches. Reports also come from Germany about a process in which beryllium may be reduced directly from the ore in the production of copper and nickel alloys. This may have an important bearing on the production cost. Alloys with iron, investigated by Hatfield and collaborators in England, have not given much hope of important industrial development; at least not with the present prices. Nether do aluminum alloys low in beryllium seem to offer much promise. The best prospect in aluminum seems to be the high beryllium alloys, but here again the present high price may be an obstacle.

The demand for beryllium in the construction of X-ray equipment is increasing, although this can never become any large outlet. Beryllium has a transparency to X-rays almost twice that of aluminum; in addition, it possesses a high reflectivity to ultra-violet light and a low tendency to sputter in X-ray tubes. A late development is the use of pure beryllium oxide as high-temperature refractory.

Among the metals that have weathered the years of depression in a fine manner molybdenum must rank high. In the pure state this metal is used mainly in grids for radio tubes and in sheets for wireless equipment, and also in contact points. The main application, however, is in ferro-alloys, in which is it claimed to have a more general beneficial effect than any other metal. An outstanding use is in cast iron, alone, or with nickel or chromium, or both. The consumption for this purpose has doubled since 1929.

Its effect is to increase strength and resistance to creep and abrasion, to eliminate porosity, and to improve machining and high-temperature properties.

Another interesting new application is for replacing part of the tungsten in high-speed steels, and in carbide cutting tools. The largest consumption, however, is in high-strength structural steel. Alloys with chromium give excellent service in crushing and grinding machinery and other equipment where high abrasion is met. Chrome-molybdenum steel is also used in airplane tubing. Molybdenum is also used to great advantage in many types of cast steel, alloyed with nickel, chromium, manganese, and vanadium. Hastelloy, a nickel-molybdenum steel recently developed, has the interesting property of being highly resistant to hydrochloric acid. With chrome and aluminum it is also a constituent in most nitriding composition. Manganese - molybdenum rails have shown favorable results, and molybdenum steels have also found other uses in railroad equipment.

### Titanium Used as Alloy And Pigment

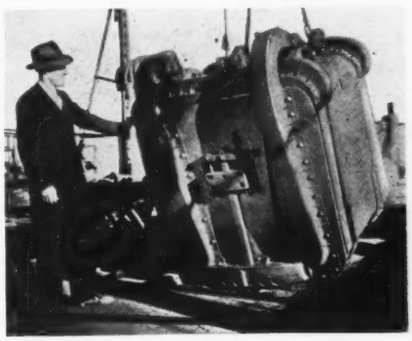
Like molybdenum, titanium has also found its way into cast iron and stainless alloys, although on a much more modest scale. It is added to cast iron to make strong alloy compositions more easy to machine, to close the pores and reduce the size of the graphite flakes. Added to stainless steel in a ratio of 5 to 7 times the carbon content, it serves to inhibit intergranular corrosion. It also prevents air-hardening and imparts ductility and softness to the steel. Otherwise, the most important metallurgical use of titanium is as a scavenger to remove oxygen and nitrogen from iron and steel. Alloyed with copper, titanium imparts age-hardening properties; the carbide is also being used in cutting steels. The output of titanium oxide, an excellent white pigment, is, however, much more important than that of the metal.

Although the tungsten filament may be the best-known application, by far the largest part of this metal is used in alloys for high-speed steels and as carbide in cutting tools. Lately, many other carbides have entered this field, such as the carbides of tantalum, columbium, molybdenum, titanium, zirconium, and boron. There is also a tendency to replace some of the tungsten in the high-speed steels with molybdenum, titanium, or vanadium. Metallic tungsten is an excellent material for contact points and in radio tubes; certain magnet steels contain tungsten, which is added as an alloying constituent.

Like tungsten, over 90 per cent of the vanadium produced finds its way into alloys steels, mainly to impart toughness to the steel. A recent development is the use of this metal in cast irons. Interesting applications in the chemical field are based on the catalytic properties of vanadium salts.

With increasing production of radium, efforts are being made to develop new industrial uses for the salts of this interesting metal, as the two main applications, in therapeutics and in luminous paints, do not seem to offer much opportunity for further expansion. There is an increasing application in radiographical testing, in which gamma rays from a radium source are used for detecting flaws in metals, particularly in pieces of large dimensions where X-ray testing is not as suitable. Radium is also used for ionizing air to make it a conductor around moving machinery in places where sparks resulting from accumulated static charges create a fire or explosion hazard. It may likewise be used to reduce time lag in flash-overs at spark gaps.

No important uses have yet been found for the related metals uranium and thorium, although they have been available for several years. The principal possibilities seem to lie in their use in photoelectric cells, as glow-tube cathodes, and as X-ray targets. Some uranium salts are used in coloring glass and ceramics.



**Chrome-molybdenum steel and duralumin enter into the construction of this 4½-cu.yd. shovel dipper. Lip and frame are of the former, side plates of the latter. Fully loaded, the dipper weighs the same as the manganese-steel dipper, which it replaces, does when empty—namely, 13,000 lb.**

### Tantalum Resists Chemical Attack

Among the most striking properties of tantalum is its high resistance to chemical attack, hydrofluoric acid, hot concentrated sulphuric acid, and strong caustic alkalies being the only chemicals attacking it. It is also one of the best valve metals known and is used extensively in electrolytic rectifiers. It is making good headway in the chemical process industries, for heaters, linings for vessels, thermometer wells, heating coils, spinnerettes, and laboratory equipment and apparatus. Nozzles used in chlorinating water are giving excellent service. In the past year a technique has been developed for heat-treating tantalum, without alloying additions, making it possible to fabricate it into various forms. It is also successfully welded and can be fabricated into seamless tubes. Another important development is the utilization of the carbide in cutting tools and for tipping tools.

The closely related metal columbium has recently been found efficient in keeping stainless steel soft and workable, both hot and cold. According to Becket and Franks, of Union Carbide & Carbon Corporation, a quantity of about 10 times the carbon content imparts great softness and ductility, with freedom from air-hardening, without sacrifice in resistance to corrosion and high temperatures. It inhibits intergranular corrosion upon chemical attack up to 900 deg. C.

Zirconium is generally used as a scavenger for removing oxygen, nitrogen, and sulphur from steel. It has a softening effect on cast iron and tends to make the graphite more finely divided, thus increasing the tensile strength and improving the machining qualities. It is also used to degasify platinum, and the carbide is sometimes added to tungsten carbide tools. Other uses are in ammunition primers, smokeless flashlight powders and photoflash lamps, in electric blasting caps, pyrotechnics, and getters for vacuum lamps.

### Calcium Forms New Lead Alloys

Metallic calcium is also found to be an effective scavenger in melting copper, nickel, lead, and steel. It has a hardening effect on lead, and much activity is displayed in the study of the lead alloys. An interesting application is the Betterton-Kroll process for debismuthizing lead. The related metal barium is also gradually finding outlets, although it is not yet possible to speak of any large consumption. It is one of the best electron emitters at low temperature, and a very efficient getter, and has therefore found some application in vacuum tubes. A nickel-copper-barium alloy is used as spark terminal, while a barium-coated electrode is employed in the new sodium and mercury lighting units to lower the starting potential.

Among the technical applications of lithium is the deoxidizing of copper and copper alloys. For this purpose it is alloyed with calcium in ratio 1:1 or 3:7. Lithium-calcium alloys are also used for treating cast iron, stainless iron, and steel. The corrosion resistance and tensile strength of magnesium may be increased by addition of lithium, and a small addition to zinc-aluminum alloys greatly increases their mechanical strength. Bahnmetall, a lead-calcium-sodium alloy containing some hundredths of 1 per cent of lithium, is used in Germany at a rate of several million pounds annually as bearing metal in railroad cars. It possesses good anti-friction and wear-resisting properties. The small lithium content promotes stability and prevents oxidation and deterioration in storage.

# ◆ OUTLOOK FOR THE MAJOR

## COPPER

*W. W. Lynch*
*Consulting Mining Engineer*
*New York City*

THE BEGINNING of the year 1935 finds the world's copper industry, as a unit, statistically in better condition than at the beginning of any of the previous three years. Viewed from the standpoint of consumption, price, and reduction of excessive stocks, there has been a progressive improvement since 1932, the darkest of the depression years for copper. Much room for improvement still exists before the industry reaches a "normal" state. There are recognized uncertainties ahead, the outcome of which may have an important bearing as to whether or not the favorable trend of the past three years is to continue.

Any appraisal of conditions in the world's copper industry would fail to give a true picture if it did not consider separately the domestic and foreign situations. Because of the large developments in the past few years in Canada and Africa, the foreign market no longer looks to the United States for a supply of copper. Consequently, the domestic industry must now measure its well-being chiefly by conditions wholly within its own national borders. The present tax of 4c. per pound on imports of copper into the United States not only tends to confine foreign producers to the foreign market but has resulted in a differential between foreign and domestic price, recently ranging from 2 to 2½c. per pound. Obviously, therefore, an analysis treating the world copper industry as a unit would be entirely misleading.

### The Foreign Industry

Whatever "depression" there may be abroad is not reflected in current rate of foreign copper consumption. In 1934 foreign demand for copper, based on deliveries of the refined product, was the highest in history. On an annual basis the trend has been upward since 1932. Moreover, there was a rising trend throughout the first eleven months of 1934, the November figure being higher than that for any other month.

The statistical trend of foreign copper demand therefore points to another record-breaking year in 1935. The surprising height to which foreign copper consumption has mounted, however, may justify a suspicion that an expectation of continued improvement is not warranted by other economic circumstances abroad. Be that as it may, it should be a comfort to foreign producers that demand for their product could drop considerably from current rate and still be as good as in "normal" times. In this regard, at least, foreign producers seem to be in an enviable position as to outlook for 1935.

The satisfactory outlook for the foreign industry in regard to demand does not necessarily justify an expectation of prosperity for foreign producers in 1935. Whereas foreign copper consumption in 1934 was higher than ever before, the price of the metal abroad, in terms of gold and the pound sterling, was the lowest in history. The mounting of foreign consumption has been accompanied by a race for position and by a price warfare among foreign producers that apparently have offset the financial benefits which otherwise would appear to have been a natural consequence.

Entrance into the foreign market of the new and formidable production of Canada and Rhodesia has been accompanied by a confusion that perhaps was to have been expected. Now, however, that these new producers, backed by low-cost operations, have established themselves in the market, the opportunity for compromise and cooperation among foreign producers seems to present itself. In fact, preliminary negotiations toward that end are reported to have already started. The opportunity for gain through cooperative action and the dire results that appear certain without it are perhaps good reasons for anticipating that the unbridled and profit-destroying competition abroad will soon have run its course.

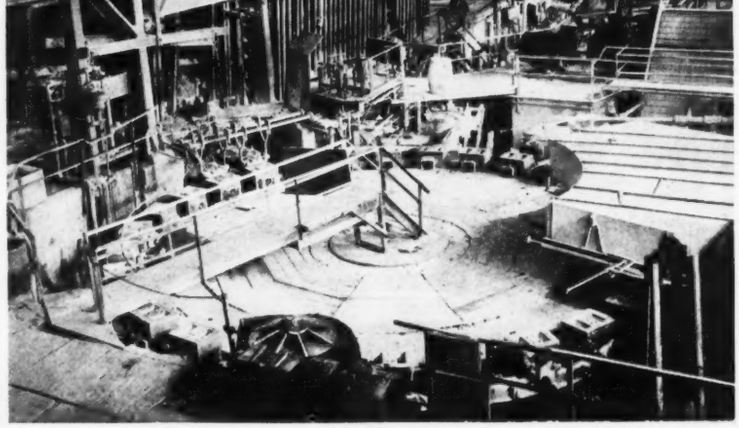
### The Domestic Industry

In all respects the domestic copper industry has shown a continued improvement since 1932. Unlike the case of the foreign industry, the domestic industry is still suffering from low consumption and burdensome stocks. As also opposed to the foreign situation, under the NRA a satisfactory control of production has long since been established among domestic producers.

The betterment of conditions in the domestic copper industry is reflected in the price trend of the past three years. The average price of the metal during 1932 was about 5¾c. per pound, delivered in New England; during 1933,

**Casting side of refining furnace at an Atlantic seaboard copper plant**

*Courtesy Raritan Copper Works*



about 7¼c. For about the past six months the price has been steady at 9c. per pound.

To a large extent the improvement in price of domestic copper since 1932 has been due to increased domestic consumption. Although domestic consumption in 1934 was only about 40 per cent of the annual average for 1928 and 1929, it was, nevertheless, 10 per cent higher than in 1933 and 25 per cent higher than in 1932. The upward trend is something to view with satisfaction and seems to augur well for the new year.

The precipitous drop in domestic consumption after 1929, coupled with the virtual loss to domestic producers of their previously important foreign market, has left the domestic industry with a plant capacity considerably in excess of current requirements. The ability of mines temporarily to resist economic laws through the "gouging" of their higher-grade ores presents a problem of production control that seems peculiar to the natural-resource industries.

Prior to the imposition of the present 4c. import tax on copper, the uncontrolled inflow of foreign copper in itself precluded any possibility of an orderly and logical adjustment between supply and demand. Consequently the period between the end of 1929 and June, 1932, the latter marking the effective date of the 4c. import tax, was one of mounting stocks and falling price. The control of the inflow of foreign copper eliminated one obstacle in the path of order. There still remained the problem of control of supply, not only from current production but from the accumulation of excessive stocks. Cooperation between the industry and the Government under the National Industrial Recovery Act has gone far toward solving this problem. Control of sales from stocks has permitted mine production to continue at a moderate rate without causing disastrous price cutting, and, at the same time, has allowed a material stock reduction. When, finally, the excess stocks have been reduced to a normal level, there will still remain the need for production control.

Statistical evidence, as indicated herein, seems to point toward a continuation in 1935 of improved circumstances in the domestic copper industry. Continued improvement will require, however, a willingness on the part of the federal Government to prevent a return of those obstacles to recovery which the present copper import tax and the relaxation of certain features of the anti-trust laws under the National Industrial Recovery Act have removed.

Under present laws the tax on imports of copper will expire on June 30, 1935; the pertinent features of the National Industrial Recovery Act, on June 16, 1935. The actual expiration of either one of these measures without further legislative action to extend their benefits cannot fail to mark an end of the rehabilitation of the domestic copper industry that has progressed so encouragingly in the past two years.

Fortunately there are no indications that the Government will fail to take such legislative action. Through the National Industrial Recovery Act, the 73d Congress hoped "to reduce and relieve unemployment, to improve standards of labor, and otherwise to rehabilitate industry and to conserve natural resources." Those commendable purposes are apparently being accomplished in the domestic copper industry as far as attending circumstances will permit. It seems reasonable to suppose that the 74th Congress will desire and therefore provide the means for a continuance of such accomplishment.

### Conclusion

Although the conditions appear to be favorable, it would not seem wise to accept, as a foregone conclusion, the assumption that either the domestic or foreign industry, or both industries, will have a better year in 1935 than in 1934. However, the ways of meeting the recognized uncertainties appear to be known; accomplishment seems to depend on a common desire and an earnest effort of both Government and the industry to bring it about.

# LEAD

*F. E. Wormser*
*Secretary*
*Lead Industries Association*

OPPORTUNITY was presented in 1934 to observe the effect of an improved silver market on the production of lead from domestic silver-lead mines and to see whether or not any apprehension of an indirect injury to lead was justified. If the record is carefully analyzed, the most that can be said is that only a small amount of lead was produced as a result of the incentive furnished by a higher silver market.

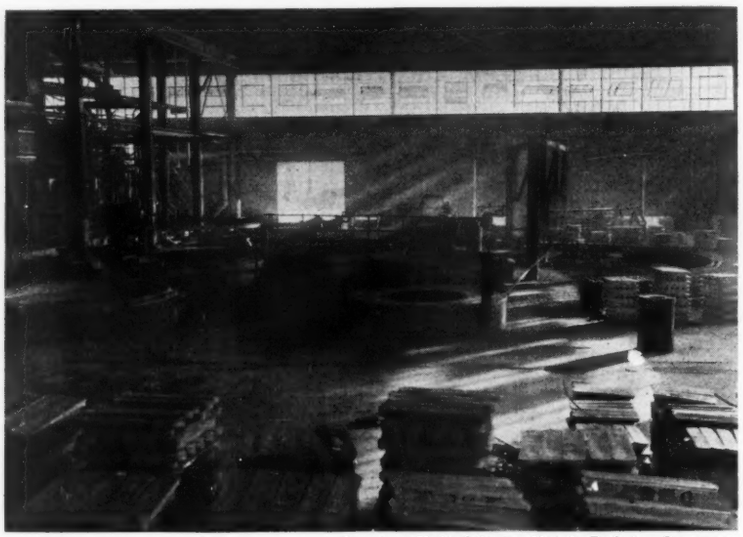
The 64½c. per ounce silver price paid by statute in 1934 represented an increase of 86 per cent over the price prevailing in 1933 (34.7c.) and is the best market the silver miners have enjoyed for eight years. When to this is added the fact that a large boost was made in the standard price of gold per ounce, to $35, it is only natural that the lead miner in the Rocky Mountain belt, from the Mexican to the Canadian border, who finds both silver and gold in his lead ore, should try to take full advantage of the opportunity to profit from the improved silver and gold markets.

Although the Missouri and Tri-State production of lead is practically silver-free, the important lead-mining states of Utah and Idaho have always derived a large amount of silver from their lead production. This offsets in part higher mining costs. Lead-mining companies in Idaho and Utah know that if they increase lead production merely to obtain more silver the resultant decline in the market for lead might more than balance any increased compensation from the sale of byproduct silver. Most of the lead producers in the West sell their ore and concentrates to custom smelters on a cash basis and do not store their lead production, and as the custom metal production is usually sold promptly in the open market, it has its effect upon the price of lead from day to day.

The importance of byproduct silver to the Western lead miner can be easily measured by an examination of the production statistics of the larger com-

panies in Utah and Idaho and gives the following interesting results:

In northern Idaho 40 to 50 oz. of silver are produced for every ton of pig lead. In Utah the ratio appears to be much higher, anywhere from 100 to 200 oz. of silver being produced per ton of pig lead by the larger operators. This is especially true of the Park City and Tintic districts. It is possible, by careful supervision of operations, to do some selective mining of high-silver lead ores, but the significant deduction to be made from these rough ratios is that in Idaho a ton of lead at today's market would be worth about $74 in New York, whereas the silver obtained as a by-product from lead mining at 64½c. an ounce would be $32. Note that the value of the lead is over twice as great as the value of the silver. In Utah the situation is different. For each ton of lead, worth about $74 at today's price, the accompanying silver is worth $65 to $129. In other words, the silver output per ton is equal to, or more valuable than, the lead. In fact, silver in Idaho might be considered a byproduct of lead mining, whereas in Utah lead appears to be a byproduct of silver mining, in the present market. Consequently, the inducement to increase mining operations for the sake of recovering silver contained in the ore should be stronger in Utah than it is in Idaho.



*Courtesy United States Metals Refining Company*

**Kettle floor at an Eastern lead refinery**

### Rocky Mountain Output

At best, the increased production of lead from the Rocky Mountain region brought about by stimulation of silver mining is slight and appears to have been obtained principally from smaller shippers, as the larger companies in Utah and Idaho do not seem to have increased their lead production in 1934.

Domestic lead-mine output in 1934, as gaged from shipments to smelters, is estimated to have been 293,000 tons of lead in ore, compared with 274,000 tons in 1933. Even if the entire increase were ascribed to the attractiveness of higher silver and gold prices as explained in the foregoing, which is an untrue assumption, the added tonnage is relatively small.

By a peculiar coincidence, the average annual price of lead has been almost identical for the last two years, with an average price of 3.86c. per pound New York in 1934, compared with 3.87c. per pound in 1933 and 3.18c. for 1932. The price of lead has been declining for some sixteen months, with one interruption, from 4.50c. New York in September, 1933, to 3.50c. in the middle of December, 1934. At the end of December an upturn in the lead market occurred, the first in many months, which brought the price to 3.70c.

### Consumption Demand Improves

There was a better demand for lead on the part of consuming industries during 1934, and it is estimated that 373,000 tons were shipped into consumption, compared with 347,000 tons in 1933. It is to be hoped that this improvement will continue in 1935 to lift lead out of a rate of consumption prevalent in 1910. The principal outlets continue to be production of lead pigments such as white lead, litharge, and red lead—a return to pre-War conditions. Close to 200,000 tons of lead pigments were produced in 1934. The market provided by lead-covered cable manufacture continues to be small. In this connection, the policy of the Administration with respect to the public utility industry in the United States is of the utmost importance for both the copper and lead industry. While the utility companies were expanding from 1922 to 1932, they spent huge sums of money improving their facilities. One estimate gives this total as $7,500,000,000 over ten years, and of this amount the lead industry received a share, probably about $215,000,000. In 1934 it is estimated that only about $100,000,000 was spent by the utilities for new construction. A revival in utility expansion would work wonders in the metal markets.

Stocks of lead in all forms increased in 1934 about 20,000 tons, the smallest increase for several years, bringing the total to about 315,000 tons at the beginning of 1935. There is enough lead on hand to supply the entire United States requirements for the best part of a year at present reduced rates of consumption, but it is well to remember that most of these stocks are in strong hands and that only a fractional reduction is needed to bring them down to a fair size. Invisible stocks of lead, those held by consumers, declined during 1934.

### Influence of Scrap

Scrap lead continues to exert an influence on the lead market far beyond what it did in pre-depression times, and although the amount of lead smelted from old battery plates is estimated to have been less in 1934 than in the previous year—namely, about 120,000 tons, compared with 140,000 tons in 1933—there is a constant accumulation of old battery lead derived from the 24,000,000-odd cars on the road in the United States, which must be used up from month to month.

Although the consumption of white lead, a very important outlet for pig lead, has been declining for many years, partly as a result of competition from cheaper paint materials, this pigment has never been excelled in paint for out-and-out economy and durability, qualities that are being appreciated to a greater and greater degree by those who have had experience with paint. It seems probable that there will be an increase in the use of white lead alone, and in combination with other pigments, as paint. Government activities, stimulating construction, not only should help white-lead consumption but help the extensive use of lead in plumbing as well.

### Improvement This Year

Strange as it may seem to speak of shortages of lead in the face of the large stocks now available, it is evident, from the statistical record of world production of all kinds of commodities during the past five years, that whereas agricultural products have generally shown increased world production, despite the depression, metal production has drastically declined. Eventually this will create serious metal shortages which it seems reasonable to assume will some day have to be made up. Let us hope that 1935 will see the beginning of a move in that direction so far as lead is concerned.

# ZINC

*Norman Hickman*
*Assistant Treasurer*
*American Metal Company, Ltd.*

IN A YEAR during which potentially drastic changes occurred in our national economy, the zinc market charted a somewhat lethargic course. Operations in the smelting and refining divisions averaged about one-third of capacity and more than 40 per cent in the pigment divisions.

The East St. Louis price of common metal was around 4.30c. per pound at the beginning of last year. It improved during February to 4.40c. and was maintained thereabouts until May, when it started a fluctuating decline to the 4.30c. level, which lasted throughout July and well into August.

### Industrial Activity

During the early months of this period, a considerable expansion in industrial activity occurred, in which, however, zinc consumption, particularly in galvanizing, shared only moderately. Monthly shipments during the first half of the year averaged more than 30,000 tons, somewhat better than the 1933 average, and stocks decreased more than 10,000 tons from their maximum during this period. But the market never really succeeded in maintaining a buoyant tone and was featured by a fairly continuous undernote of nervousness. Intermittently contributing to this was the ore situation in the Tri-State district, where it was found difficult to regulate the output of concentrate, and where overproduction threatened from time to time.

The market trend turned definitely downgrade in the late summer, and the price fell away week by week to a November low of 3.65c., from which it steadied to 3.72½c. at the year end. During the second half of the year overproduction of common metal became increasingly evident and almost entirely accounted for the increase in stocks from 97,000 tons on hand at the end of July to the 116,000 tons total at the beginning of December. Shipments of High Grade metal, although closely aligned with production throughout the year, exceeded the latter by 3,500 tons during the January-November period. They were particularly heavy during the first four months of the year, when, as during the preceding four months, High Grade metal accounted for more than half of the total shipments. This condition developed again in October and November.

An interesting change has affected the country's zinc stocks since 1930, when they totaled more than 143,000 tons and were about evenly divided between High Grade and common metal. Although total production declined both in 1931 and 1932, the decrease was principally in High Grade, particularly in 1932. The net result is that, as of Dec. 1, 1934, the stocks of common metal amounted to more than 100,000 tons, an increase of about 27,000 tons since the end of 1930, whereas High Grade stocks have decreased during that period by 55,000 tons, and now approximate only about one-eighth of the total, in contrast with one-half four years ago.

Despite the fact that the year ended with common zinc near its low, showing a quotational loss for the year of about $12 a ton, there are several elements of soundness and promise in the current situation. The galvanizing industry, so important a factor for common metal, was disappointing throughout most of 1934. A more optimistic feeling with regard to its prospects for 1935 now animates many galvanizing interests. Tangible expression of this better feeling occurred in December, when substantial purchases for galvanizing account were made. Not only was the belief prevalent that zinc was unduly low in price, but it was also recognized that a much improved demand for galvanized products, especially from hitherto depressed agricultural regions, was a reasonable likelihood in reflection of higher farm incomes and a further improvement therein due to the expectation of heavier crops in 1935 at relatively high prices. The many uses of zinc cannot, in increasing opinion, fail to be stimulated through the manifold outlets of Government expenditure. This expenditure was really the most significant factor of 1934, although its implications and results may not yet be realized. The continuance of these unprecedented disbursements during 1935 seems likely, as does an eventual repercussion on the volume and price levels of those commodities, such as zinc, which have as yet shown no substantial improvement.

### Outlook in Various Fields

The outlook for zinc in the pigment field is promising; here, again, one must face the prospects of the huge Government-financed housing projects and of the increased degree of home renovation already in progress. In the brass industry a substantial pick-up has followed the low rate of operations established in September, and brass-company officials are generally sanguine of a continuance of, as well as an increase in, their improved operations. Zinc enters the important automobile industry both through the medium of brass and in the form of die castings.

**Pouring zinc ingots at a Western zinc plant** *Courtesy Anaconda Copper Mining Company*

The latter use of zinc has shown an increase both in volume and diversity during 1934.

The zinc market suffered during the second half of last year from the chronically recurring spectre of overproduction. There was manifestly an excess production of common metal, but all the facts of the case do not seem to have been quite so dire as the shadow they cast. With respect to ore, for example, after all the long-continued nervousness about overproduction in the Tri-State district, the year closed with the ore market firm at $26, a dollar higher than at the beginning. Ore stocks in that district increased during the year only about 6,000 tons, and during December there was news of the adoption of a new and apparently effective plan of curtailment by the Tri-State operators. Fear of overproduction in other zinc-producing fields has been expressed by reason of the higher silver market. A rather complicated subject is hereby introduced, and it is recommended that those interested should study Economic Paper No. 10 of the United States Bureau of Mines, entitled "The Economic Relation of Silver to Other Metals in Argentiferous Ores."

In brief, it may be said that the weight of evidence and experience inclined to the conclusion that high prices for copper, lead, and zinc stimulate concomitant silver production, rather than that a high price for silver alone creates an excess production of these base metals. Particularly in the case of zinc, by reason of its predominant occurrence in non-argentiferous ores, the interrelation of its production and silver prices is rather tenuous.

It is difficult to summarize the zinc market because it does not reflect a straight-line industry. The interests of the industry's constituents are spread unevenly over various unrelated lines—for example, sulphuric acid, pigments, and fabricated zinc. Consequently slab zinc has assumed in many instances a byproduct character. This is one of the clues to its recurring market difficulties.

# NICKEL

*Robert C. Stanley*

*President*
*International Nickel Company*

TO THOSE who followed world industry down to its low point in June, 1932, and who have watched its fluctuations since that time, the record of the past twelve months is an encouraging and convincing chart of improvement. Although the experiences of the past five years have discouraged the practice of measuring progress by the speed of our advance towards new objectives, we already can look back with some degree of satisfaction.

The nickel industry, in supplying a demand both worldwide and industrially diversified, has directly benefited from this general improvement. World consumption of the metal in all forms for the first ten months of 1934 was 102,780,000 lb., as compared with 77,600,000 lb. and 49,500,000 lb., respectively, in the corresponding periods of 1933 and 1932. This continued recovery gives promise that the record of 112,481,600 lb. in the first ten months of the peak year 1929, may be attained again in due time.

World consumption is divided for convenience into that of Canada and the United States on the one hand, and that of the United Kingdom, Western Europe, Russia, and Japan on the other. In these two categories are included all of the leading industrial nations, and it is significant that consumption during 1934 has been about equally divided between the New World and the Old World groups.

Sales in the Old World for the first ten months of this year have equaled those for any similar period in previous history. They included a 40 per cent increase in monel metal, due largely to growing activity in the textile, chemical, and engineering fields. Nickel sales were also reflected in the 30 per cent increase in the production overseas of various alloys with high nickel content. The United Kingdom was the outstanding purchaser, and Australia became during the year a substantial buyer of fabricated nickel steels.

An important factor in the strengthening of the Old World market has been the growing recognition of the automobile as an article of use rather than of luxury.

Other contributing factors are the return of the European countries to the "hard" money to which their peoples were accustomed prior to the post-War inflation in paper money, the increasing popularity of nickel plating, and the growing industrialization of Russia.

Here in Canada and the United States the increased volume in 1934 has resulted more from the better demand stimulated in established markets by general business improvement than from the opening up of new industrial fields for the application of nickel. Of these various markets transportation continues to be of outstanding importance, the automotive industry alone having taken some 30 per cent of the nickel consumed.

In the railroad field the advent of stainless steel trains of the "Zephyr" type is creating an important market for nickel alloy steels and nickel cast irons in the construction of both the cars and the diesel engines with which these streamlined trains are powered. This development is having its effect on steam and electric locomotive design, and nickel steels and cast irons are consequently being used to develop greater power without increasing the size and weight of the engines. At the same time the general adoption of air-conditioning for passenger equipment is creating an expanding field for Edison nickel storage batteries. And these building and modernizing programs of the railroads are still in their initial stages.

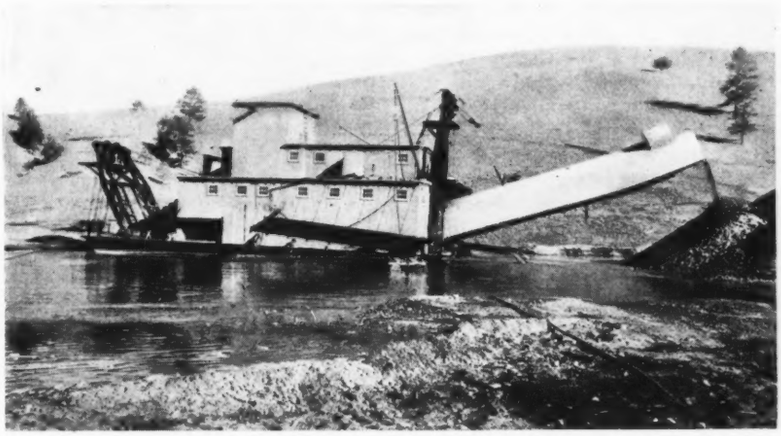
# GOLD

*Washington Correspondence*

UNITED STATES production of gold in 1934 (Philippine Islands and Puerto Rico excluded) is estimated at 2,800,000 to 3,000,000 fine ounces. These figures compare with 2,628,775 fine ounces in 1933 and 2,330,020 fine ounces in 1932. The relatively small improvement in gold production during the last two years, despite the higher price of $35 per fine ounce for the metal, is attributable to the fact that gold derived from copper ore has decreased more than 352,000 oz. since 1929. The great decrease in the quantity of base ores containing gold and silver treated in the United States is said by the United States Bureau of Mines to be shown by the fact that in 1929 about 67,989,000 tons of base ores yielded 334,106 oz. of gold, whereas in 1933, 10,512,347 tons of base ores yielded 162,544 oz. of gold. It is evident, states the Bureau, that with the mining of base ores at low ebb any large increase in the domestic mine output of gold must come from placers and from dry and siliceous ores.

In 1933, 25.17 per cent of the mine

production of gold was from placers, 67.77 per cent from dry and siliceous ores, 4.59 per cent from copper ore, 0.59 per cent from lead ore, 0.01 per cent from copper-lead and copper-lead-zinc ores, and 1.87 per cent from lead-zinc ore. Distribution of 1934 production, as far as sources are concerned, is expected to show no material variation from these respective percentages.



**Increased production of gold from placers has, in the last few years, largely offset the decline in output from base-metal sources. In 1933, for instance, 25 per cent of the total gold production was from placers, and of this nearly 70 per cent was recovered by 64 dredges**

Any speculation concerning the 1935 outlook for gold must be influenced primarily by the monetary factor. In appraising this factor, it appears now that there are at least four possible alternatives that should be considered. In the first place, due consideration should be given to a continuance of the existing monetary relations; secondly, currency stabilization on a gold basis is very much a possibility; thirdly, an additional 10 per cent devaluation of the dollar is possible under the Act approved May 12, 1933; and a fourth possibility, which is by no means remote, would be for the European gold bloc to be forced off the gold standard.

### Continuance of Existing Relations

At the end of January, 1934, Congress passed the Gold Reserve Act of 1934, which provided that title to all monetary gold in the United States should be vested in the United States Government, and that, in case the President should, under authority of the Act of May 12, 1933, reduce the weight of the gold dollar, this weight should not exceed 60 per cent of the old weight. On Jan. 31, 1934, the President issued a proclamation fixing the weight of the gold dollar at 15-5/21 grains nine-tenths fine, or at 59.06 per cent of the former weight of 25.8 grains. At the same time he gave notice that he reserved the right to alter or modify this proclamation as the interest of the United States may seem to require. Effective Feb. 1, 1934, the United States Treasury undertook to purchase all gold offered at $35 an ounce, compared with the old statutory price of $20.67 an ounce, and to sell gold for export to foreign central banks whenever our exchange rates with gold-standard currencies reached the gold export point.

Devaluation of the United States dollar and the applicability of the higher American price for gold to the international market were responsible in the early part of 1934 for an unprecedented drain of gold from the European gold bloc to the United States. This development appeared at the time to spell the doom of the gold bloc, while even more threatening was the power given to the United States President to devalue the dollar by an additional 10 per cent and so to bring into being a recurrence of this drain of gold to America. That power, however, has not been exercised and the readiness to wield it has become perceptibly less in recent months. President Roosevelt has, and not without ample reason, lost some of his faith in the purely monetary solution to economic problems. He has realized the importance of confidence on the part of the private and institutional investor as a factor in the recovery of prices and trade. To all intents and purposes, therefore, the dollar has been reestablished in terms of gold, and stability in monetary affairs appears to be regarded as the paramount need of the day, but only on the present basis.

Neither the United States nor Great Britain desires to lose the advantages to be gained by an undervalued currency. The inflationary experience of France and Germany makes it almost certain that the gold bloc will not depart from gold voluntarily. The best conclusion that can be reached would therefore seem to be that the monetary position of gold in 1935 will remain very much on its present basis.

Devaluation of the dollar, which increased the price of gold from $20.67 to $35 an ounce, acted as an important stimulant for increasing gold production. Assuming the conclusions set forth in the foregoing are correct, gold production in 1935 should equal, or be somwehat greater than, the production of 1934.

### International Currency Stabilization

If the gold bloc can be kept on gold, it seems highly improbable that currency stabilization will be effected during 1935. As here pointed out, the United States and Great Britain and the countries tied to sterling have been reaping the benefits of undervalued currencies and will be loath to return to a par basis with relation to gold currencies unless compelled to do so. It is therefore not difficult to understand why the American authorities should have recently gone out of their way to support the currencies of the gold bloc. There is no wish on the part of America to increase the gold reserve. Any such increase only postpones the day on which the goal of a 1:3 ratio between silver and gold in the metallic reserves will be reached and will thus run counter to the silver policy of the country. Not only have the gold bloc currencies been supported in the open market, but a Federal Reserve credit was opened in favor of one of the gold bloc central banks. What American support may have left undone, the British stabilization fund has hastened to do.

Should currency stabilization take place in 1935, it is somewhat difficult to say just what effect it would have on the price and output of gold. It seems almost certain that the world price of gold will not return to $20, but there is no certainty that it will remain at $35. The production of gold would, of course, be very much influenced by the price which was finally agreed upon. The price agreed upon would in the end most probably be a compromise between the gold bloc and the United States and Great Britain, and would be somewhat lower than the present $35 per ounce.

### Additional Dollar Devaluation

Although there seems less and less likelihood of an additional 10 per cent dollar devaluation, it is the only one of the four possibilities, mentioned in the opening paragraph, which would be certain to stimulate added gold production, as it would immediately increase the American price of gold from $35 per ounce to $41.34. The London open market price for gold would adjust to the American price almost immediately.

Even though the power to devalue is now possessed by the President, and the 1934 elections have certainly strengthened the inflation forces in Congress, recent actions of the Administration indicate that monetary stability is very much to be desired. The removal of foreign exchange restrictions by Secretary Morgenthau on Nov. 12, 1934, was

the most recent move of the Administration, indicating that no change in the gold value of the dollar is contemplated in the very near future.

### Position of Gold Bloc

Despite repeated and confident prophecies of its imminent disintegration, the gold bloc still stands. The recent Brussels Conference and the protocol which was signed there provided an unequivocal reaffirmation of faith in gold as the basis of currency. From time to time one or the other of the gold currencies comes under suspicion, but in the end the bloc remains firm. In France, which is, of course, the mainstay of the gold alliance, the will to adhere to the present parity appears never to have been stronger. This is not the least surprising. Even though devaluation may be completely justified and economically desirable it still savors of subterfuge. To appreciate this we have only to look back to the British reception given some years ago to demands that the chronic overvaluation of the pound sterling should be corrected by devaluation, since it could not be corrected by the appropriate measure of deflation. The strength of this feeling is all the greater in France, because in a nation which is essentially one of small rentiers, the memories of one drastic devaluation of the franc are still painfully vivid.

Although it is indicated above that the gold bloc is not alone in its desire to stay on gold, but is backed up by the United States and Great Britain by means of the Equalization and Stabilization Funds, there still are very grave possibilities that the bloc will be forced off gold.

In the end, adverse balances must be settled by gold, and although the technical gold reserve position of the gold bloc countries is still strong, there are signs of weakness in the general economic and political outlook of these countries. With increasing unemployment, lower industrial production, declining tourist trade and immigrant remittances, as well as adverse balances of trade, it is difficult to see how the gold bloc countries are going to stop the drain of gold to the United States, a country whose balance of payments position seems to become stronger and stronger.

Should the gold bloc countries be forced off gold, there is some possibility of a higher gold price in the international market, which would, of course, stimulate gold production. It is, however, difficult to see how countries whose economic condition appears worse than that of the United States could draw any appreciable amount of gold from her. It therefore seems reasonable to believe that the international price of gold will continue at approximately the American price of $35 per fine ounce.

# SILVER

## *Washington Correspondence*

DAILY STATEMENTS of the United States Treasury in December, 1933, listed silver bullion on hand at less than $37,000,000. This bullion on Nov. 30, 1934, amounted to $74,000,000, valued at the then prevailing cost of the metal. In addition, bullion in reserve against silver certificates totaled, on the same date, $160,000,000, making a grand total of $234,000,000 of bullion. If to this silver is added the silver dollar and subsidiary coins in the United States, the total silver stock of the country comes to about $1,100,000,000. As our gold stock exceeds $8,100,000,000, the amount of silver which *should* be in monetary use, according to the Silver Purchase Act of 1934, is $2,700,000,000. This means that we must still buy enough silver to coin $1,600,000,000—that is, about 1,232,000,000 fine ounces more.

### American Production

A curious fact is that not all the output of American mines is being delivered to the mints by producers. According to Treasury figures, American-mined silver delivered to the Government under the Proclamation of Dec. 21, 1933, amounted to 19,315,000 fine ounces on Dec. 7, 1934. During the first ten months of 1934, American mines yielded an estimated 21.6 million ounces, to which should be added the output of the last ten days of December, 1933, and the first seven days of December, 1934, bringing the total production during the period under consideration to about 23,000,000 oz. What happened to the missing 3,700,000 oz.? Some may be in process of treatment at smelteries and refineries. Perhaps some is being held back by the producers in the hopes that the world price will soon bring them more than the 64½c. they are now receiving!

The effect of America's accelerated silver purchases following nationalization on Aug. 9 may be seen in the gold-silver ratio in London. From 75 to 1 on Aug. 1 the ratio fell to 63 to 1 by the first of December. A continuance of this trend is likely in 1935, although the rate of change cannot at this time be predicted.

### Purchasing Power

With any further increase in the price of silver, the purchasing power of producers will benefit. The purchasing power of an ounce of silver based upon the London price of the metal and wholesale commodity prices in the United States is already in excess of 100 per cent of its 1926 level. It follows that the purchasing power of an ounce of American-mined silver (at 64½c.) is 133 per cent of its 1926 level. That its purchasing power will be even higher in 1935 seems probable. Lack of close relationship between the price of silver and its production by American mines is easily evident in a comparison of production figures for 1934 and 1933.

### Bonus to Producers

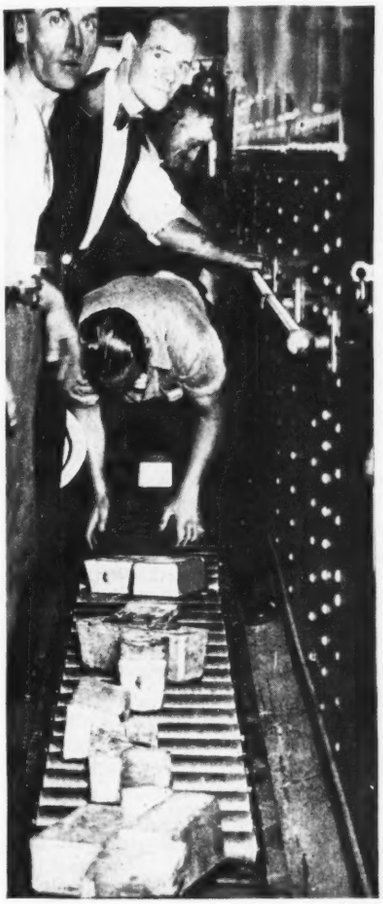
When President Roosevelt fixed a price of 64½c. for American silver late in 1933, he gave producers here a bonus of 50 per cent above the prevailing market price. Yet the average monthly output of silver in this country through October was only 2,160,000 oz. in 1933, compared with 1,933,000 oz. in the whole of 1932, or an increase of 12 per cent. In the month of October, 1933, output here was 1,800,000 oz., and in October, 1934, 2,100,000 oz. A very large and prompt increase in price in 1935 would apparently be necessary to augment the output of American mines materially.

Nationalization of silver yielded about 110,000,000 oz. between Aug. 9 and Dec. 7, 1934. No additional stocks worth noting are believed to exist in this country, with the exception of American-mined silver eligible for delivery to the Government at more than the "nationalization" price of 50c. per ounce. A second nationalization order, although legally permissible, is therefore quite unlikely during 1935. The total of 110,000,000 oz. mentioned in the foregoing is much smaller than many observers predicted would be obtained. It must be remembered, in this connection, that the Government had bought up a considerable quantity of silver in New York prior to the nationalization order of Aug. 9.

### Attitude of China

China's attitude toward silver has become clearly defined. It may be stated as one in opposition to a price advance out of line with international commodity prices. The export duty imposed by the Nanking Government in October, and various other measures taken in November and December to safeguard China's monetary stock of silver, have not prevented smuggling. Should the world price of silver advance materially in 1935, the incentive to smuggle silver out of China will grow proportionately. From China's standpoint such an outflow will prove troublesome and irritating, and some fear Chinese growing

resentment at America's silver policy may possibly result in the familiar device of a trade boycott. As yet, fortunately, the general public in China seems to be unaware of the implications of America's large silver purchase program. China's resentment, one should note, is tempered by her desire for American favor vis-à-vis Japan.



*Acme*

**London silver moving into the strong room of a transatlantic liner for shipment to the United States during the Government's silver buying of last summer.**

China cannot afford to be too resentful.

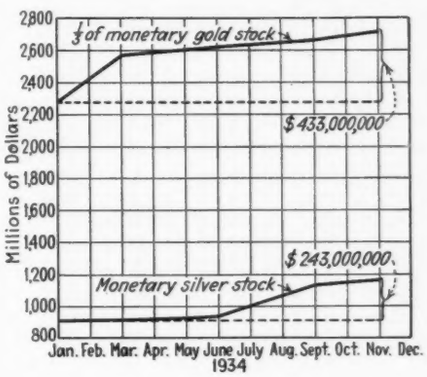
However troublesome America's silver purchases may be to China, the subject continues to be one of rather general indifference in the United States. Mere notes of inquiry from the Government of China, or even mild protests, are insufficient to stimulate a reversal of American feeling about the Silver Purchase Act of 1934. Repeal of that Act in 1935, or drastic modification of it, seems to be out of the question. Inasmuch as the Act does not specify the rate of purchases, the Treasury has the power to slow down its buying materially. Whether or not it can do so with political safety during the next year is a question unanswerable at this time. But the chances are that business will gradually improve in 1935 and inflation sentiment proportionately decline. At the moment, to promise China any real modification of the silver program would seem impossible for America. That China will put her currency back on the silver standard in 1935 is unlikely. Possibly a managed currency for *external* purposes will prevail there until the gold standard can be adopted. With China off of silver, only Hongkong remains as a *full* silver-standard country among countries engaged in world trade.

## Sales by India

The Indian Government will most likely continue to sell silver up to the amount permitted for 1935 by the London Silver Agreement. With rupees moving into circulation again, the Government's surplus stock is becoming progressively smaller, and any large supply of silver from that quarter is out of the question. More than 4,000,000,000 oz. of silver are held in India in the form of ornaments and coin. Most of this silver, was, of course, acquired at prices above the present market price. To sell it now, therefore, would entail a loss to the holder, who is, in any instance, not disposed to part with his savings. Owing to the import duty on silver, the metal has a higher market value in India than abroad. Silver sold outside of India, accordingly, must be sold at a sacrifice. This explains why non-governmental sources have not been yielding any metal to the London market for sale to the United States Treasury. Such Indian selling as has taken place in London in recent months has been limited to silver exported by the Government of India in excess of the bazaar capacity to absorb it, or silver bought in London by Indian speculators. Were India to suffer a bad crop year or some other economic setback, silver might appear on the world market as "distress silver." Such an eventuality is quite unpredictable. The belief is that silver in London would have to rise to the equivalent of about $1 per fine ounce before any appreciable amounts would be forthcoming from India.

## Education Necessary

In connection with silver from India, one must remember that hoarded silver in use as jewelry and the like is more than a "savings"; it is a mark of social standing among one's neighbors. For Indians to sell such silver ornaments merely because the market price of silver is high would require the education of vast numbers to the merits of investment in securities and other forms of wealth not literally visible to one's neighbors. Such education is making some headway, but only slowly. A recent Indian financial periodical of standing points out the unlikelihood of a large outflow of silver from that country. It states: "It is not to be supposed that the middle classes, who doubtless have large holdings of silver in various shapes, would proceed immediately to realize the pecuniary advantage from the improvement in silver prices. And it would be idle to expect that the masses would be governed by the day to day quotations of the bullion market. If the masses are to sell silver, they would do so only under the inexorable pressure of economic necessity. . . ."




**These two curves must meet if the objective of the Silver Purchase Act is to be achieved. See footnote**

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● **NOTE:** The objective of the Silver Purchase Act of 1934 is to make the country's silver stock equal one-third of the gold stock. In the sense of the Act, silver is in monetary use if it is held by the Treasury or by the public. Such silver has a "monetary value" of $1.29 per ounce. Thus, $100 worth of standard silver dollars, each containing about 77/100 oz. of silver, is equal to $100 in monetary value. But $100 face value of subsidiary silver containing only 72/100 oz. of silver per dollar of face value is not equal to $100 in monetary value, but to $\frac{129+}{138+} \times \$100$.

Keeping this necessary adjustment in mind, one arrives as follows at the "monetary value" of our silver stock, or our "monetary stock" of silver, on the basis of published returns of the Treasury Department:

Held by the public: Standard silver dollars, 100/100 of face value; subsidiary silver 129/138 of face value.

Held by Treasury: Standard silver dollars, 100/100 of face value; subsidiary silver, 129/138 of face value; silver bullion held against certificates, 100/100 of listed value; silver bullion carried at cost, which is not known, about 129/50 of book value.

According to the aforesaid method of calculation, our monetary stocks of silver and gold in certain recent months were as follows:

| 1934 | Silver | Gold(*a*) | ⅓ of Gold |
|---|---|---|---|
| Jan. | $916,000,000 | $6,830,000,000(*b*) | $2,277,000,000 |
| March | 919,000,000 | 7,695,000,000 | 2,565,000,000 |
| June | 936,000,000 | 7,856,000,000 | 2,619,000,000 |
| Sept. | 1,129,000,000 | 7,978,000,000 | 2,659,000,000 |
| Nov. | 1,159,000,000 | 8,130,000,000(*c*) | 2,710,000,000 |

(*a*)As shown in Federal Reserve Bulletin. (*b*)Adjusted for "revaluation" of dollar. (*c*)Preliminary estimate.

# NEWS OF THE INDUSTRY

## American Mining Congress Adopts Constructive Plans

**James F. Callbreath Retires as Secretary After Thirty Years' Service, but Continues as Secretary Emeritus—Succeeded by Julian D. Conover, Formerly Secretary of the American Zinc Institute**

IN THE course of its annual meeting in Washington, D. C., Dec. 13-15, 1934, the American Mining Congress faced the common problems confronting the mineral industries in 1935, called for a united front of the various branches of the industry, recognized the need for cooperative action with other organized groups of American industry, and affirmed its willingness and intention to cooperate with the Government for economic recovery. The spirit of the meeting was embodied in the opening address of President Howard I. Young and in the resolutions finally adopted. There was ample evidence that the officers and committees of the Mining Congress have been doing a lot of constructive and realistic thinking and planning, and have shown a capacity for leadership of the industry.

Mr. Young reviewed the magnitude of the mineral industries and their normal relation to national welfare: 12 billion dollars of invested capital, 1,700,000 persons employed, annual production valued at 4¼ billion dollars, payroll of 2¼ billion dollars annually, and a contribution of 22 per cent of the federal tax income. Nevertheless, the industry is in distress because the durable- and capital-goods industries—the normal market for metals—are badly depressed. Revival of mining must wait to that extent on general business recovery.

### Relations With the Government

Considering prospective federal legislation, Mr. Young opposed national restriction of hours of work—specifically the proposed 30-hour law—as likely to reduce purchasing power, increase the cost of production, contract the distribution of goods and services, and raise the cost of living. He recognized the peculiar characteristics of mining and other natural-resource industries as warranting measures of production control under an extension and modification of NIRA, and felt that governmental cooperation would be desirable and essential. He took a liberal and favorable attitude toward old-age pensions and other forms of social insurance, but felt that the subject of unemployment insurance required further study before a plan was adopted. On the subject of taxation he pointed out the great need for relief from the present burden and urged cooperative efforts in that direction with other organized industrial groups.

Secretary Callbreath reviewed the work of the Congress for the past year, stressing the necessity for solidarity in the industry so that united action could be taken for or against those conditions and measures that are likely to promote or retard business recovery. He made special reference to the necessity for further amendment of the Securities Exchange law to aid legitimate capital investment in mining.

### Activities Recommended for the Bureau of Mines

**1. Technological efforts to promote use of domestic deposits of essential minerals which now are imported in large quantities.**

**2. Development of information and technological methods to bring fullest possible production of gold in the United States.**

**3. Provision of a national inventory of known reserves of essential minerals and extension of conservation and economic use of those minerals.**

**4. Establishment of the Bureau of Mines as procurer and distributor of all mining information for governmental agencies, including "New Deal" units as well as "old-line" organizations.**

**5. Extension of research and development work relating to minerals essential to national defense.**

**6. Expansion of the Bureau's ability to aid mining operations by impartial clearance of information to the mining industry and to industries which use minerals as raw materials.**

**7. Restoration, to its former extent, of the training of miners in first-aid and mine rescue methods.**

### Program for Bureau of Mines

One of the outstanding features of the meeting was the vigorous sentiment for support of the United States Bureau of Mines, taking tangible form in a booklet prepared by a special committee. Ten thousand copies have been printed for wide distribution among legislators, state and national, and other public groups. The object is to disseminate basic information on the magnitude of the mineral industries, their great contribution to national wealth and welfare in comparison with other industries, the relatively meager federal support of mining as compared with that extended to other basic activities, the problems that merit federal consideration, and the necessity for adequate support of a federal bureau. A specific recommendation was made for an annual appropriation of $2,000,000 for the Bureau of Mines. The recommended activities of the Bureau are summarized herewith.

### Deane Plan for Employment

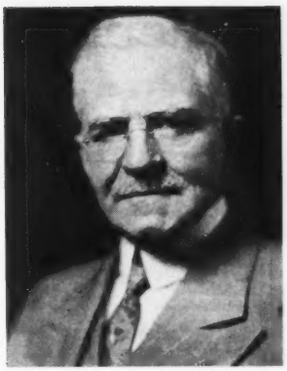
The Congress listened attentively to a national plan for stabilizing employment and sustaining purchasing power, presented by A. L. Deane, vice-president of General Motors Corporation. Inasmuch as the basis of profitable business is a constant supply of customers with continuing purchasing power, and inasmuch as the great mass of purchasing power resides in the low-income groups of people who must have jobs in order to live, Mr. Deane seeks a method of automatically insuring employment without standardizing or restricting hours and wages. His yardstick would be a long-time (ten-year) average of weekly hours of employment, which would represent the highest average level of employment attained in the country during that period. His short-time index would be the monthly average of weekly hours of employment, which would represent current conditions. Whenever the monthly average was below the long-time average, payrolls would be supplemented by an amount equal to 1 per cent for each hour of deficiency. Whenever the short-time average of an employee rose

above the long-time, the employer would pay a tax of 1¼ per cent on the payroll of such employee, for each hour of excess. The plan would have to be national in scope, operated by a federal corporation with a revolving fund, into which payroll taxes would be paid when hours of employment exceeded the long-time average, and out of which supplemental pay to employees would be made when the short-time average fell below the long-time. The object of the plan would be to combat deflationary or inflationary movements in their inception and introduce a factor of balance which is now lacking.

### Cooperation With Manufacturers

One session of the Congress was devoted to the need of cooperation among organized industrial and business groups. The outstanding contribution to this session was made by C. L. Bardo, president, National Association of Manufacturers. His organization has just finished an intensive study of "the road to recovery," and he discussed the platform adopted in New York early in December. Of greatest interest to the mining industry is that part of the program dealing with future relations of Government to industry. The Association proposes further emergency legislation for one year, to supersede NIRA, to afford an opportunity to continue on a voluntary basis those functions of NIRA that have proved worthy of further trial. Such legislation should be administered by an independent court having power to approve or disapprove, but not to initiate or impose, codes of fair trade practices and labor provisions. If upon such further trial the legislation should be beneficial to industry and labor, and in the public interest, it could be made permanent.

The manufacturers recognize the necessity for conservation of natural resources, and agree that industries based on them may require special consideration and specific legislation for the control of orderly production. In employment relations and industrial disputes the Association favors collective bargaining in forms satisfactory to the worker and without coercion from any source, rights of minorities and individuals, mediation and arbitration, and making organized labor responsible for its acts. It opposes remote federal control of local labor disputes, the forced acceptance of labor unions, arbitrary restriction of hours as in the 30-hour bill, and sympathetic strikes and lockouts.



JAMES F. CALLBREATH,
Secretary Emeritus

JULIAN D. CONOVER,
Secretary

### Resignation of J. F. Callbreath

At the close of the meeting Mr. Callbreath announced that he had found it necessary to be relieved of the active burden of the secretaryship and that he had asked the Board to select his successor. He was elected secretary at a meeting in Portland, Ore., Aug. 26, 1904, and has served over 30 years in that capacity. By appropriate resolution and with many expressions of appreciation and affection, the Congress voted its recognition of Mr. Callbreath's long and zealous service, and made him secretary emeritus in order to continue to have the benefit of his general counsel and advice.

The new secretary of the Congress is Julian D. Conover, until now secretary of the American Zinc Institute. He will assume his new duties in Washington at once. Prior to assuming the secretaryship of the American Zinc Institute in 1929, Mr. Conover was for five years secretary of the Tri-State Zinc & Lead Ore Producers' Association. Earlier engagements included geological and mine examinations in various sections of this country, Alaska, and South America. He graduated in mining engineering from the University of Wisconsin and served as a major of artillery in the World War.

Officers of the Congress elected for 1935 are: President, H. I. Young; first vice-president, D. D. Moffat; second vice-president, J. B. Putnam; third vice-president, D. A. Callahan; secretary, J. D. Conover; secretary emeritus, J. F. Callbreath.

## Resolutions Reflect Policies

**These are the topics on which resolutions were unanimously adopted:**

**1. Planning—Cooperation with the Government in exploiting natural resources. Industry planning essential if cooperation is to be effective. Governmental approval of plans is to be expected, but supervision should not extend to active participation in management.**

**2. Recovery—Mineral-industry prosperity is dependent on recovery of all industries, particularly those making durable and capital goods. Hence the necessity of cooperation.**

**3. Wages and Hours—These should not be the subject of federal legislation. The 30-hour bill is unsound and should not pass. No attempt should be made by law to shorten the work week.**

**4. Money—Stabilization of monetary policy is desirable for early restoration of business confidence.**

**5. Taxation—Present policies are forcing capital investment in Government bonds and restricting private investment in business. Taxation should be restricted solely to means for revenue and not used as an agency for the redistribution of wealth.**

**6. Government Competition — The Government should retire from competition in the business enterprises of its citizens.**

**7. Labor—The Congress favors collective bargaining; freedom of choice on the part of the worker, without coercion from any source, to select his own representatives, and to join or refuse to join any labor organization. Means should be provided to make organized labor responsible for its acts.**

**8. Bureau of Mines—Adequate financial support for this Bureau and the United States Geological Survey, to permit them to meet the legitimate demands of the mineral industries.**

# Committee Studies Bureau of Mines And Geological Survey

**Science Advisory Board Appointed at the Instance of the President Reports Against Consolidation—Recommends Stronger Financial Support—Outlines Logical Activities for Effective Service**

THE Science Advisory Board, appointed at the instance of the President to advise the Government on the functions, standards, and programs of its scientific and technologic bureaus, and headed by Karl T. Compton, president, Massachusetts Institute of Technology, has made public reports of a subcommittee on the relations of the Bureau of Mines and Geological Survey. In addition to responding to requests for advice on specific activities, the Board has also attempted "to look beyond the details of program, procedure, and personnel, toward the great social objectives of science, to see which of them are the necessary part of government and how each bureau can contribute toward them."

Among the problems early considered by the Board was the organization, programs, and personnel of the Geological Survey, the Bureau of Mines, and the Minerals Division of the Bureau of Foreign and Domestic Commerce. Four advisory reports on the relations of these agencies were made by a committee consisting of C. K. Leith, Frank W. DeWolf, and Frederick M. Becket.

The first report dealt with the question of combining the Geological Survey and Bureau of Mines, with the recommendation that "we can see no gain, either in efficiency or wise economy, in combining the two bureaus." In fact, loss of efficiency probably would result on account of unwieldy size, the specialized scope of each bureau's work, and the difficulty of finding a single director who could successfully comprehend the entire field.

### Mineral Economics and Statistics

One result of its investigations was to impress the Board with the possibility of concentrating and strengthening the work in mineral statistics and economics which was scattered among the Economics Branch of the Bureau of Mines, the Bureau of the Census, the Minerals Division of the Bureau of Foreign and Domestic Commerce, and the Geological Survey. In its early deliberations the Board gave some support to the idea of setting up in the Department of the Interior a separate bureau of mineral economics and statistics, correlative with the Bureau of Mines and the Geological Survey, and the subcommittee made a preliminary report to that effect. An excellent case can be made for concentration in one bureau of the scattered pieces of work on mineral economics and statistics, especially at this time when information and data on the mineral industries are badly needed in connection with planning for mineral production.

Instead of following the preliminary suggestions of the committee, however, and setting up a separate bureau, a comparable step has since been taken that will ultimately meet the economic and statistical needs of the industry. In the transfer to the Bureau of Mines of some of the activities and personnel, notably J. W. Furness, of the Minerals Division of the Bureau of Foreign and Domestic Commerce, the first move has been made to accomplish the committee's aim. As chief of the economics branch of the Bureau of Mines, Mr. Furness will doubtless develop as rapidly as possible the full program suggested by the subcommittee for a separate bureau.

### Adequate Financial Support Needed

In its study of the Bureau of Mines and the Geological Survey, the committee found both organizations badly handicapped in performing their vital functions by lack of financial support. Strong recommendations are made for adequate appropriations.

Inter-bureau transfers of certain types of work are recommended in the interest of adhering closely to the functions of each bureau and avoiding illogical growth. It is proposed to transfer from the Bureau to the Survey the former's work on geophysical prospecting; and from the Survey to the Bureau the former's supervision of mineral leasing and production on Indian and public lands. Finally, it is proposed that consideration be given to transfer from the Bureau of Mines to the Bureau of Standards the former's studies in metallurgical constants, physical metallurgy, and physical chemistry.

### Conclusions Regarding Both Agencies

In brief, the committee recommends the restoration and development of fundamental geologic investigation which, in the past, gave the Geological Survey international repute and greatly benefited our mineral development. Land classification calls for a more adequate program. Topographic mapping should remain a function of the Survey and be pushed to completion. Publication of the Survey's work should be expedited and adequate office space provided. Better use should be made of the facilities of the Survey by other governmental agencies, such as the Public Works Administration. Cooperation between United States and State geological surveys should be encouraged, with the federal agency taking the lead. Looking to the future orderly development of our mineral resources, the committee sees in the Survey an indispensable factor that needs to be strengthened.

The Bureau of Mines is the subject of numerous recommendations, summarized as follows: Mining engineering activities should be continued on the broadest scale possible. In mineral processing investigations the committee recognizes three types of activity: process research in production, process research in fundamentals, and research in constants. It is felt that the Bureau may well limit its research activities in mineral processing to fields not yet pioneered by industry and concentrate its efforts on research in fundamentals. Process research on production should be left to the industries which are, in the main, technically and financially able to conduct their own research. Any research of this character requested by industry should be supported by it under a cooperative research agreement with a representative group of producers. Nonmetallic processing investigations should be continued after careful review of the field. Health and safety work are vital and should be expanded. The Bureau should avoid public consulting service competitive with consulting engineers in private practice. In conclusion, the committee points out the need of restoring the Bureau and its personnel to a pitch of efficiency adequate to meet the demands of the Government and the industry as recovery advances.

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## Col. Crawford Seeks Government Positions for Engineers

Active efforts by the American Engineering Council to develop opportunities for the employment of engineers in the government service have resulted in the appointment of Col. C. H. Crawford, of New York, to carry on this service in behalf of the American Society of Mechanical Engineers, American Society of Civil Engineers, American Institute of Electrical Engineers, and the American Institute of Mining and Metallurgical Engineers.

A recent canvass by the Council of Government departments and agencies revealed not only that there are numerous openings for the employment of engineers from time to time but many other positions that engineers can fill.

By personal contacts throughout the Government establishment in Washington, Col. Crawford is said to be educating officials to the desirability of enlisting the services of engineers for activities of much wider scope than is ordinarily associated with the engineering professions by personnel officers.

*Keystone*

**Scene of 1934's gold strike. Soledad Mountain, near Mojave, Calif., where George Holmes and his father encountered high-grade orebodies in the Silver Queen mine. Gold Fields Development Company, which recently completed an examination of the property, holds an option on it that involves a cash-and-royalty purchase price of $3,250,000**

# Mojave, Calif., Gold "Boom" Features News of the Month

## Tombstone, Ariz., Joins List of Ghost Towns to Revive Under Increased Gold and Silver Prices—Spectacular Strike at Empire Mine—Calumet & Hecla Acquires Ishpeming Gold Mining

KEEN INTEREST is being taken by mining men in the increased activity prevailing in the Mojave, Calif., mining area. The major high-grade strike of the last year—the Silver Queen—has developed into sizable orebodies, and is responsible for the gold rush, bringing with it a substantial influx of men and feverish staking of claims, during December. The Silver Queen mine is on the west slope of Soledad Mountain, about 7 miles south of Mojave, and consists of one claim of 18 acres. George Holmes, who discovered the property in 1933, and his father, M. A. Holmes, control it. Neighboring mines are the Queen Esther, operated at one time by the late Seeley Mudd, and the Elephant-Eagle, on which the Wingfield interests of Nevada are said to be considering taking an option. Since the discovery, the owners of the Silver Queen have developed the mine to a depth of 400 ft. below the outcrop, with a lateral development along the vein for a distance of 700 ft. Practically all ore shipped so far has been obtained from development on the vein. The Silver Queen vein strikes N.40 deg. W., dips 60 deg. NE., and is 7 to 40 ft. wide. Vein quartz is mineralized with cerargyrite, argentite, and gold. About 70 per cent of the values contained in the ore is gold; the rest is silver. Total production to date is said to exceed $200,000, the average value of the ore shipped being $30. Gold Fields American Development Company, American operating subsidiary of New Consolidated Gold Fields, Ltd., of London and South Africa, has taken an option on the property that involves $3,250,000 in cash and royalty. An examination of the mine was recently made by C. T. Herron, J. Boyd, Carl Lindberg, Hugh Rose, and J. C. Browning. Well-known mining men who visited the Mojave district during December include Senator Key Pittman, of Nevada; former United States Senator Tasker L. Oddie, George Wingfield, Walter Trent, E. A. Julian, and Roy A. Hardy.

W. B. Tucker, district mining engineer, State Division of Mines, Los Angeles, Calif., writes as follows concerning the Mojave boom: "In my article in the November issue of *Engineering and Mining Journal*, on pages 519 and 520, I described the Silver Queen mine in detail. Since that date, the owners of the Silver Queen mine have intersected the workings on the 200-ft. level with an adit. The orebody on the 200-ft. level has been developed for a length of 700 ft., with an average width of 14 ft. and a maximum of 40 ft. in the southeast face, average value being $30 per ton in gold and silver. At a point 180 ft. northwest of the shaft, a winze has been sunk 180 ft. in depth. It is reported that the ore developed in the winze carries from $30 to $70 per ton over a width of 6 ft.

"The principal excitement due to the development of this property—the notoriety given it in the papers—was caused by the Gold Fields American Development Company taking an option on the property for a reported purchase price of $3,250,000; also the fact that many prominent engineers representing many large mining companies have visited the property in the past six months. For the reason that most of the ground in the district is patented mining claims held by individuals and companies, and also because a certain amount of railroad land may have mineral possibilities, I do not believe there will be any real mining boom in the district. However, it may lead to a number of the older properties which have had some production being taken over by individuals or mining companies under option, with the possibility of doing a certain amount of development work.

"West of the Silver Queen mine some claims, owned by Burton brothers, of Tropico, known as the Soledad Extension No. 1, Hope Extension, and Soledad Wedge, have been acquired by Senator Key Pittman, of Nevada, and his associates, under option. These parties have also taken over the Duplex, Duplex Wedge, and Starlight Extension claims owned by Bert Fisher, of Mojave, and will probably start some development work. These claims are located on Soledad Mountain, west of the Silver Queen mine." Other developments during the month that center about gold include increased activity at Tombstone, Ariz., which definitely places that locality in the list of revived ghost towns, and Calumet & Hecla's purchase of a controlling interest in Ishpeming Gold Mining, lessee of the Ropes property, Michigan's first gold mine.

A summary follows of the more important news events in the various mining areas during December.

### *California*

Hughes-Mitchell Processes, controlled by Denver capital, is reported to have acquired the old Blue Light silver and zinc mine, in the Santa Rosa district, near Anaheim. Preliminary work is said to be under way to reopen the mine and recondition the surface structures, which include a mill. The company has also under construction a processing plant at Torrance, which is to treat complex ores of lead and zinc. A special process has been developed to manufacture lead oxide, zinc oxide, litharge, and zinc sulphate, and about 30,000 tons of complex lead-zinc-iron sulphide ores, to be obtained from the mines in Inyo and San Bernardino counties and probably from Goodsprings, Nev., and 20,000 tons of trona salts are to be

treated and used by the plant yearly. The plant is scheduled to go into operation on Feb. 1, 1935. W. H. Rose is president of the company, T. M. Mitchell, vice-president and general manager, and L. M. Hughes, director. Offices are maintained in the Majestic Building, Denver, Colo.

Steady production has been started at the Lucky John drift gravel mine, at Paradise, according to an announcement by Collins Pacific Company, engineers, of San Francisco, which company is operating the property for its owners, California Goldfields. The plan of operation is unique in that the gravel channel is being mined on a room-and-pillar system and gravel washed into sluice boxes within the mine. The sluice discharges into a raise chute containing a discharge opening 90 ft. below the channel, whence the sand is trammed in cars to the dump 1,000 ft. distant. Boulders are held back in the stopes, thereby saving handling about 30 per cent of the aggregate and materially reducing costs. Pillars left between rooms can be withdrawn on retreatment from the operation limits of the drift.

Grass Valley Bullion Mines, operating the Bullion mine, near Grass Valley, has resumed operations following litigation in San Francisco courts with Empire-Star Mine over apex rights and boundary lines. Ore mined on the 800- and 1,500-ft. levels is trucked to the Hoge mill, near Nevada City.

California mining men are watching with interest the shaft-boring machine employed by Idaho Maryland for sinking a 1,000-ft. auxiliary shaft, to be known as Idaho No. 2, near Grass Valley. The device is the invention of J. B. Newsom, Palo Alto mining engineer. It consists of a drive head powered by a 40-hp. motor and the core barrel proper measuring 5 ft. in diameter. Cores 8 ft. long and weighing over 10 tons have been extracted. No. 6 chilled iron shot is used for cutting, and the cores are released at the bottom of the shaft by wedges and hoisted to the surface by a 150-hp. hoist installed recently. The total depth drilled so far exceeds 150 ft.

Pumping was stopped late last month at the Argonaut and Kennedy mines, in Amador County, operators refusing to grant demands made by striking miners. The Central Eureka and Original Amador mines also continued idle as a result of the Amador County gold miners' strike, which began early in October.

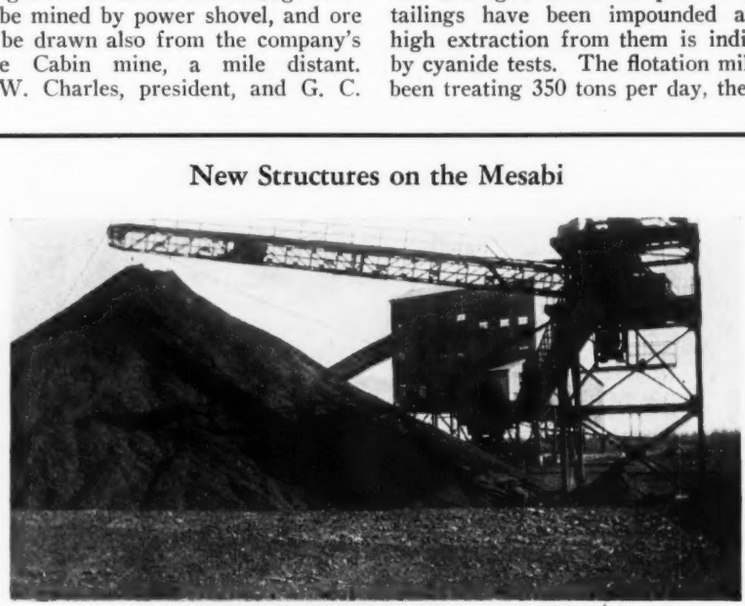
## *Nevada*

In little more than two months' time a 500-ton cyanide leaching plant has been constructed and placed in operation at the Pony Meadows mine of Stone Cabin Consolidated Mines, in the northern part of the Como district, Lyon County. The former 200-ton flotation mill has been put on a 400-ton per day basis, and the early addition of larger crushing equipment will enable the combined plants to handle 500 tons per day. Low-grade ore above the haulage level will be mined by power shovel, and ore will be drawn also from the company's Stone Cabin mine, a mile distant. W. W. Charles, president, and G. C. Snyman, engineer and director, from the company's Philadelphia office, witnessed the start of the new cyanide plant.

Operation of the 75-ton cyanide mill of Gold Circle Consolidated at Midas, Elko County, has been resumed, the mill treating 40 to 60 tons per day from the 900-ft. level of the Elko Prince mine and from leases. Three smaller mills are operating in the district on the Esmeralda, East Standard, and Young properties, and another is planned for the Miners Gold. Discovery of placer gold in gulches caused some excitement late in the season, but production has been small because of water shortage.

Enlargement of Arizona Comstock's flotation mill to 500 tons' capacity and completion of its cyanide leaching plant have been financed, according to a statement by W. J. Loring, president and managing director, who has been in Chicago. Metal recovery by flotation has averaged about 60 per cent, but tailings have been impounded and a high extraction from them is indicated by cyanide tests. The flotation mill has been treating 350 tons per day, the bulk of ore being drawn from the large open cut in the outcrop of the Comstock lode on the Hale & Norcross mine. In November the mill treated 9,379 tons that had a gross value of $50,012. Two carloads of ore, 96 tons, shipped from a newly discovered high-grade shoot at the south on the 365-ft. level had an assay value of $9,669. Concentrate to the value of $28,261 was shipped to the Selby smelter. Funds provided by the new financing will be applied to enlarging the flotation mill and the partly constructed cyanide leaching plant, building an additional 1,500-ton fine-ore bin, providing 4-ton skips and large ore pockets in the inside shaft, with another receiving bin in the Norcross tunnel, and completing about 6,200 ft. of development work, which will include enlarging the Chollar tunnel.

### New Structures on the Mesabi



**Above—Ore-stocking equipment of a new type erected recently by M. A. Hanna Company at the Mesabi Chief washing plant, Keewatin, Minn. The stacker belt, 100 ft. long, may be swung through an arc of 300 deg. Capacity of the plant is about 100,000 tons. Below—New washing plant at the St. Paul mine of Corrigan McKinney Company, near Keewatin, Minn. Overflow from a log washer passes to a hydrotator, the first installed as standard equipment in any plant on the Mesabi**

Examination and sampling of central properties in the Goldfield district have been in progress for some time by a group of engineers that includes Augustus Locke, of San Francisco; Harrison Schmitt, of El Paso; Paul Murphy, of Houghton; James B. Boyd, of Los Angeles; and several others. The examinations, according to reports, are connected with efforts of Goldfield Deep Mines to finance construction of a mill on its Florence mine. Long-term leases are said to have been sought by the company on some of the properties of Goldfield Consolidated Mines.

A 40-ton amalgamating and concentrating mill at the Dixie Valley mine of Comstock Keystone, in Churchill County, is treating high-grade gold ore under the direction of E. A. Montgomery, president and manager. A three-compartment incline shaft, designed to open the wide ore zone at depth, is being sunk near the footwall by Pardners Mines, which has an option to purchase the property. Gold in the ore is coarse, necessitating a clean-up of plates every three hours. Pardners Mines also is reopening and sampling, under option of purchase, the Buckhorn mine, in Eureka County, 6 miles northeast of Cortez. The Buckhorn was opened and equipped with a 300-ton cyanide mill in 1910, but the ore proved of too low a tenor to yield a profit with gold at $20 per oz.

Trucks are delivering equipment for a 75-ton amalgamating mill to be completed soon on ground of Sierra Nevada, which is reopening old tunnels in Cedar Hill, at the north end of the Comstock lode. Near this point a crosscut is being driven far to the west on the 1,200-ft. level of the Union shaft, in search of the "base" vein that was opened on the 2,000-ft. level, now under water. Application, according to reports, will be made for an RFC loan, to mine a large tonnage of high-grade ore which has been blocked out in the Ophir mine.

A compressor and an air hoist have been provided at the 1,300-ft. tunnel of Divide Extension Consolidated, near Silver City, and the mill, equipped with 40-ton Lane crusher-wheel mill, plates, concentrating tables, and amalgam trap, is reported to be making a satisfactory recovery of gold. A new drift from the bottom of an incline winze was reported to show a 2-ft. width of high-grade gold ore.

Provided lately with additional settling tanks, the 70-ton cyanide mill of Hartford Mining, above Silver City, was reported by George Drysdale, manager, to be operating at capacity. He said that a large tonnage of good mill ore had been blocked in the old mine, which had been idle for many years.

The East drift on the 500 level of the Silver Butte Consolidated mine, Mud Springs district, is nearing the intersection of one of the largest fissures showing on the surface.

Development of International Smelting in its Mountain City mine, Elko County, is being centered on the orebody struck recently between the 400 and the 500 levels. This deposit, believed to be the continuation of the high-grade copper orebody in the old shaft, is being outlined on the 500 level, and a winze is being sunk on that level to prospect it at depth.

Development has been started in the Blue Bird group of twelve claims in the Centennial mining district, 69 miles north of Elko, by Gerald B. Hartley, of Goldfield, and his son, Gerald B. Hartley, Jr. The Blue Bird claims lie between the old Bull Run and the Edgemont mines, producers of gold in the early 90's. Camp buildings have been erected by the Hartleys, and a hoist is being installed. Encouraging gold values have been uncovered by preliminary work. The Big Four mine, a mile north of the Blue Bird, is being cleaned, mapped, and surveyed for sampling and geologic study.

## *Minnesota*

December was rather quiet in the iron-ore districts, as the operators were busy making up their plans and budgets for next season. They also give their employees a two weeks' vacation during the holidays, as such rush work as stripping ore deposits is almost completed.

A work relief project for test-pitting iron ore state-owned lands has been approved by the Minnesota State Emergency Relief Association. More than $13,000 will be spent and about 60 men employed.

At a recent meeting of the Minnesota Tax Commission the iron-mining operators in St. Louis County appealed for reduction of valuations on their properties ranging from 18 to 20 per cent for taxation purposes. Opposed to them was counsel representing St. Louis County and range communities.

## *Arizona*

Tombstone, ghost city for years, famed for its Bird Cage theater and Boot Hill cemetery, has returned to life, as a result of the increase in gold and silver prices. Most spectacular of recent strikes is the new orebody encountered at the Empire mine of Tombstone Development. Last month eighteen cars, averaging $1,000, were shipped. Previously, regular shipments of development ore were made over a period of months. Continuation of prospecting promises more of this silver-gold ore. United States Smelting, Refining & Mining, leasing the Toughnut property from Tombstone Development, has shipped the first carload of ore following a six months' program of exploration and development. Sebring and Hayward, operating a cyanide plant on the Head Center claim of the Development company, report a shipment of bullion that assayed 0.024 gold and 0.942 silver. Three R's Mining and Tombstone Extension are shipping ore; Herschel is producing bullion. Exploration is in progress at the Sultana, Morning Star, Cloudy Day, and West Side properties. Several operators are mining ores in which gold values predominate. This is in contrast to the past record of the district. Shipments since 1879 amount to 30,000,000 oz. of silver and only 250,000 oz. of gold.

Cochise County is experiencing mining activity outside the Tombstone and Bisbee districts. At Carr Canyon, a 50-ton mill is being constructed by Tungsten Products to treat ores from scattered claims in the Huachuca Mountains. At Dos Cabezos, Consolidated Gold Mines operates the Dives mine. Originally located in 1877 as the Bear Cave, the property was worked intermittently, producing $40,000 in gold up to 1920. Consolidated has driven 125 ft. on the East Emma vein, from which high-grade ore is supplied to run the mill three shifts daily. A 1,900-ft. adit has been driven to No. 7 vein. A 100-ft. winze on the West Dives has been extended to permit drifting on the 600 level to pick up the Dives vein. Plans for heavier equipment underground and increased milling capacity have been announced. In the same district, the Gold Prince, also located in the 70's, is again working.

Activity in Mammoth district, Pinal County, centers in two projects: Molybdenum Gold, a subsidiary of Molybdenum Corporation of America, is working the old Mohawk and New Year mines. These mines, developed by 5,000 ft. of workings, supply a low-grade molybdenum ore that carries gold. Molybdenum, with some vanadium, is recovered by tabling; the gold by cyaniding the table tailings, in a 100-ton plant. The company plans to deepen the mines below the water level on the 600. Mammoth-St. Anthony has opened the old Mammoth mine, from which nearly $2,000,000 in gold was extracted since its discovery in the 80's. Ore from this mine will be milled by Molybdenum Gold, when the mill capacity is doubled following the erection of a power line from Winkelman.

Bunker Hill Arizona, at Sombrero Butte, plans a 100-ton mill following extensive reconditioning of the mine. The main shaft, dewatered and repaired, is in use, permitting work on the 300 level. Water has been impounded in two reservoirs. Power is supplied by a new diesel engine. Gold Basin Mines, along Groom Creek, near Prescott, has been producing a ton of concentrate a day in a rebuilt stamp mill. Plans for the construction of a 50-ton flotation concentrator are under consideration. Sterling Gold, at Cordes, is milling ore

from the old Richinbar property, once held by the George Hearst estate. About 60,000 tons of ore have been blocked out, including some of high grade that can be shipped without milling.

Stuart Gold Reef is operating five stamps at the Golden Reef property, in the Cave Creek district. The tunnel has been advanced a total distance of 550 ft., to explore the vein system. Mine Operators has unwatered the Red Rover mine, with the expectation of shipping silver ore to El Paso. Hillside Mines has put a flotation mill in regular operation on the Lawler property, acquired last year. Two properties at Cleator that have resumed shipments of silver ore to the El Paso smelter are the Silver Cord and Gold Crown Silver, the latter after a four-year shutdown.

Less than 90 days after fire destroyed the Katherine mill, west of Kingman, the Gold Standard mill was completed and placed in operation on its site. The new mill was designed with 600 tons' grinding and 400 tons' tank capacity, the latter to be increased. After two weeks' run, the plant is reported to be handling 500 tons a day. Although the Tyro and Roadside mines supply some ore, the largest source is the Arabian property, where a power shovel is employed. Additional ore is expected soon from the Minnie mine, 7 miles from the mill. This ore will be moved by aërial tramway down the mountain to trucks for haulage to the mill. Gold Standard has added the property of New Comstock Mining to its holdings in Mohave County.

The old Portland mine, north of the Katherine, has been leased by Texas interests. Numerous veins have been intersected by a development drift.

Construction of a 500-ton cyanide plant is planned by United Verde Copper. Feed will be a gold-bearing quartz gossan held in reserve for use in fluxing direct-smelting copper ore. Owing to the outlook for copper, reserves of commercial ore have been reestimated at a low figure. The fluxing ore will be ground and floated in the copper concentrator, which has not been operated for more than four years. Tailing will be cyanided in the new plant.

The 100-ton flotation mill of American Smelting & Refining at the Octave mine has begun regular production. Mining from the 1,100 level of the Joker shaft is on a two-shift basis. Near by, Illinois Mining is making shipments of precipitates to the Selby smelter. Alvarado has unwatered the shaft to the 1,000 level and installed a hoist and a compressor.

Arivaca Placers, at Ruby, with a capacity of 500 yd. a day, is operating steadily, with 8-yd. trucks hauling gravel to the washer. King Tut placer properties, west of Kingman, 6 miles from the Colorado property, have been financed by a Chicago syndicate. The gravels cover 3,000 acres, but lack of water prevented working without adequate backing. A pipe line from the river is planned.

McCabe mine reports an orebody on the 600 level. Milling operations on the old dumps are being continued while the mine is being opened and explored. Commercial ore is being mined at five leases on the Belmont property, near Superior. C. H. Smith has struck a rich orebody, shipping one carload valued at $86 a ton. Belmont plans resumption of development on the 400 level. Western Apex has retimbered to the 300 level in the course of its program of reopening the mine to the 700 level. Dump ore is being shipped to the Tom Reed mill. At Cherry, prospecting continues at the Cherry King, Lucky Dime, and Leghorn properties.

Rehabilitation and unwatering of the Gold Road mine, at Oatman, have been started by United States Smelting, Refining & Mining, which recently acquired the property. A crew of 26 men was put to work.

## *Utah*

Operations have been resumed at the American Flag mine, Park City, by Park City Development, under the direction of A. L. Hurley, manager. Two headings are being driven on the 1,100 level on ore showings, and shipments of gold-silver ore are being made. The company has erected a modern fireproof steel building to house its hoist, compressor, and shops, and to replace the surface plant destroyed by fire last summer.

The cyanide plant of Annie Laurie Consolidated Gold Mines, at Kimberley, is being enlarged under the direction of W. A. Young, manager. About 40 tons of ore is being treated daily. A set of 14x27-in. rolls was recently installed. About 60 men are employed, 30 in the mine, 15 in the mill, and 15 at general miscellaneous work. Floyd Herring is mine superintendent; A. F. Dunyon, mill superintendent; and R. F. Turnbull, general superintendent. W. Mont Ferry is secretary, and B. F. Bauer, of Salt Lake, is president

Sinking of the new double-compartment shaft of Lewiston Peak Mining, at Mercur, has reached a depth below 200 ft., according to George W. Snyder, vice-president and general manager. The collar of the shaft is near the foot of the old Consolidated Mercur dump. The company is also building a pipe line from a spring 2 miles south of Mercur, to supply water for mine and culinary use.

A new compressor and hoist have been installed at the West Dip mine, near Mercur, under the direction of L. K. Requa. An old 700-ft. incline shaft and several hundred feet of tunnel have been reopened and put in condition for operation. Considerable milling ore has been developed in the vicinity of one of the old stopes on the 900 level.

*(Continued on page 46)*

**HERE'S THE MAIN REASON why the Filipino Legislature is trying to impose heavy taxes on the gold mines of the Islands. This shipment of more than 30 bars of gold bullion is half a month's production of Benguet Consolidated. D. W. Butner, general superintendent of the company, seated at the table with cigar in his hand, is supervising the mailing of the gold at the Baguio Post Office. J. B. Sehorn, Benguet mine accountant, is seated beside Mr. Butner. When the Filipinos hear about such shipments as this one, they promptly think that the mine owners are getting rich—never stopping to consider the capital invested and the skilled work necessary before the little gold bricks can be made from the rock of the Benguet hills**

# NEWS FROM WASHINGTON

*By Special Correspondent*

EVERY PHASE of mining and mineral industry appears due for Uncle Sam's critical review during the next few months as Congress convenes and takes up the most stupendous program of legislation ever attacked. Already the influence of Washington over labor and money is evident to every division of these industries. Before the current session of Congress adjourns it will be equally clear that mineral resources, power supply, and policies of development are almost equally under federal influence—one is tempted to say even federal control.

### Logrolling

Under these circumstances the industry must understand how the present Administration works. The technique of Washington is so different from that which has prevailed heretofore that it is difficult to appreciate the trends from day-to-day events. It requires a telescopic periscope to see what is just ahead, because at all times the real objective being sought in legislation is likely to be obscured. And often the fog or the mountains of uncertainty seem deliberately placed in order that the legislative objective may be approached before well-organized industry can note the trend and prepare to present its wishes and views.

Then, too, there is the technique of allowing the more radical proposals to appear to have definite official support, when there is no real intention of pressing these *ultra*-reforms. As a consequence, when the Administration offers to accept much less drastic authority or plans than seemingly had first been expected, industry finds itself enough relieved of fears to consent. This is a most subtle form of logrolling and legislative trading, which will be particularly important in matters of legislation affecting labor, inflation, budgetary matters, and power regulation.

A more specific type of trade is expected when the A. F. of L. comes up demanding both the 30-hour week by compulsion and the acceptance of majority rule in labor adjustments under the famous Section 7a (perhaps it would be called infamous in some divisions of industry). It is probably not expected by labor leaders that they will gain both of these objectives. Interested industry, therefore, can well make up its mind which of the two or how much of either can well be granted willingly as an evidence of social progress in order to avoid the more radical unworkable features for which American industry is not yet adequately prepared. And incidentally it will be important to sell in Washington the idea that preparation for these radical laws is more than a matter of psychology and progressiveness of individual management. An actual financial development and a preparedness to meet international competition are essential prerequisites, especially for mineral commodities that are of world interest.

### Labor Laws

Social legislation is now generally accepted as an outstanding part of the job of the new Congress. Even Tory-like business executives read the handwriting and are trying to prepare for the forecast change in business relationships. Though they tremble at the financial burden implied, they are actually about Washington beginning to talk as if they happily accepted some measure of immediate responsibility for unemployment insurance.

The Administration clearly intends to force back on state or local authorities the responsibility for relief of the unemployable. The President apparently has with determination charted a course of FERA aid only for the people to whom jobs can be given; that is, those who are employable in times of good business. Also, there is a growing recognition in federal offices that the employment so given must be at a wage rate less than commercial wages in order to induce the worker to get off the federal roll on to some private payroll as quickly as possible. The difficulty of this remains in the attitude of organized labor, which consistently objects to having artisans work at less than union rates. Contrariwise, Washington is beginning to ask whether it is better to be idle at a rate of $1 per hour or to work a reasonable time at 75c.

### Power Supply

Cheap power has become one of the major and conspicuous objectives of the Administration. Most talk relates to power for farm and home. But cheap power for the mining and metallurgical industries would be an essential part of any plan formulated. Only these industries, particularly those of an electrochemical and electrometallurgical nature, can afford the necessary long-hour, high-capacity-load-factor part of the total business. Without such industries, wasteful use of investment is inevitable.

Incidentally, the President has within his control a considerable part of the necessary authority to go toward his objective of half-price power. Much of the cost of delivered power is capital charge. Hence if the President wishes to substitute 4 per cent Government credit for typically 8 per cent commercial money, he would be already a third or a half way toward his objective.

Under these circumstances, the holding-company managements are in the embarrassing position of playing pinochle with a chap who not only keeps the score but also makes the rules of the game as he goes along. Operating companies are not under like disadvantage. The President apparently distinguishes clearly between the two company types, with frowns for the Wall Street management and at least friendly gestures for the competent operators of subsidiaries. This is an important distinction, because by protecting the subsidiaries the widow-and-orphan investor, as well as the savings bank and insurance company, are freed from the major threat of destroyed investments now in operating company bonds.

### Tin Inquiry

Resuming its tin inquiry, the House special committee suddenly finds itself deeply enmeshed in a fundamental mineral policy. The original authorization for this committee's work came about through real or pretended alarm over exports of clean tin-plate scrap to Japan. That export was, in fact, an Oriental move to build up stocks of certain grades of iron, not at all seriously an effort to get tin. But the tin red herring drawn across the trail has diverted the legislative hounds, who now bay at new game.

A wide variety of proposals has been made to the committee during its holiday-period sessions. There is some evidence that certain interests are undertaking to build up a case for a tariff on tin of 6c. a pound, or perhaps a bit more. The argument implied, though not brazenly expressed, is that the United States should free itself from British tin monopoly by creating a domestic tin-refining business.

Bolivian, Chinese, and like "independent" sources of tin ore are described as the principal raw material. But frequent allusion to domestic reserves makes clear that part of the objective sought is to establish within the United States some economic justification for the mining of tin from low-grade or scattered reserves. It is interesting, though usually not emphasized at the hearings, that these reserves, only recently inspected by United States Geological Survey specialists, seem wholly inadequate to care for even a small part of the total United States consumption. For comment on the Alabama reserves, one of the most promising domestic sources, see *E.&M.J.*, December, 1934, page 562.

A less radical proposal is that the United States confess a desire for domestic tin smelting by offering a direct subsidy bonus for tin smelted in the United States either from domestic or imported ore. Some think the bonus should be greater on domestic ore, say 6c. a pound.

Some think that the bonus should increase as the size of the smelting activity is increased, starting perhaps as low as 2c. a pound for small operations and reaching 6c. a pound when domestic industry is established on a good basis to supply, say, 50 per cent of the current domestic requirements of the country.

The argument of those backing these ideas is twofold: First, they say this would not raise the price of tin imported from foreign smelters, as a tariff surely would. In the second place, this plan would encourage the establishment of domestic operations sufficient with secondary tin to carry us well into any emergency period, such as a war, despite temporarily interrupted imports. There is no indication how interested Congressmen may feel about these proposals; but it is evident that certain commercial groups not yet clearly defined are behind the plan for novel legislation.

### Scrap Export

Despite the new character of the tin inquiry, the committee has not wholly lost sight of the fact that export control was one of the original subjects to be studied. It has been pointed out, however, that control of the export of tinplate scrap is economically of no consequence as compared with the very real economic significance to domestic tin users of the export of bearing-metal scrap, old automobile radiators, and the like. If such export were eliminated, it is estimated that the total secondary tin could equal perhaps 30 per cent of the United States requirements. Those who object to such export do so on the ground that sending tin-containing scrap abroad places in the hands of our foreign customers a cheap raw material which may even convert them from customers into producing competitors. Those who propose such export embargo point, as a precedent, to the practice of the Argentine, which has a steel industry built wholly on scrap and protected by embargoes against export of iron and steel.

One absurd proposal has been made to the committee that "there should be no export of tin plate, since tin is so precious as a strategic metal." Coming from such men as an assistant secretary and a member of Congress, this idea has carried weight despite its absurdity. These men apparently forget that curtailing our exports of tin plate would throw out of employment many American workers in the steel and tin-plate industry of the United States. In fact it would completely upset the normal tinplate marketing practice of the world. These American companies, by maintaining four to eight months' stocks of tin for their own needs, are hedging, and to a certain extent stabilizing, the price of this metal. They are also protecting the American producers against large loss in the event that foreign monopoly control should suddenly boost the price of tin between the time when orders for plate are received and prices agreed on and the time when deliveries are accomplished.

Incidentally, Washington points out with respect to tin, that Bolivia as a producer is in a precarious financial condition. Some suggest, therefore, that possibly the United States could make a bilateral treaty with that country to take its tin exports under favorable terms and thus save American investors from capital loss and also build up the desired domestic industry and independent American-controlled supplies.

### Mineral Policy

Washington confidently expects the establishment of a new National Planning Board to be named by the President as a permanent agency for study of land, water, power, and mineral problems of national concern. This recommendation of the National Resources Board exceeds in importance all other features of that voluminous document (see pages 4-6 of this issue). Regardless of economic or technical detail authorized by the law, the setting up of a principle of national planning will mean the acceptance by the Government of the responsibility for resources policy. This has long been a theory, since Teddy Roosevelt and Pinchot made their conspicuous play, but has never been in fact a workable plan. First steps toward such a permanent board are likely to be taken in this Congress, probably even in the current session.

It is expected that the Bureau of Mines will remain a fact-finding agency with enlarged funds and increased activity, regardless of the scope or character of the new policy board. Wisely, it appears, the plan can keep fact finding and publication of data separate from policy making and administrative control. Incidentally, an early increase in the funds available to the economics branch of the Bureau of Mines is expected. More complete and prompt statistical services will doubtless result.

The Science Advisory Board emphasis on the need for $16,000,000 to stimulate research is also important to mineral industries, because it includes a plan for the study of "mineral resources in their economic, social, and political relations, and particularly in regard to conservation." It is not stated by the Board who would do this work if the money was authorized.

# Upward Revision of Freight Rates Favored by I.C.C.

*Washington Correspondence*

CURRENT developments in Washington indicate that cost of transportation is likely to become a more important factor in mineral industry cost and profit. In its recent decision in the non-ferrous metals case, the Interstate Commerce Commission deferred any broad increases in rates because of the depressed condition of the industry. The Commission raised the rate level on scrap, however, and revealed that it still regards rates on ores, concentrates, and metals as too low in comparison with rates on other commodities. In the railroads' case for a general upward revision in rates on all freight, which the Commission now has under consideration, the effects of depression upon an individual industry must stand camparison with its effect upon all industries, including the railroads. Should the Commission decide, therefore, that the railroads are justified in attempting to recoup to some extent in higher rates what they have lost by decline in volume of traffic, it is probable that the rates on non-ferrous minerals and metals will be raised at least as much as the charges on other kinds of freight. Otherwise, the relationship of non-ferrous rates to rates on other freight that, in the Commission's opinion, is already out of line, would be further distorted.

Possibly the increases authorized by the Commission will be greater than the railroads propose, as Commissioner Joseph B. Eastman points to the rates on non-ferrous metals as affording "an illustration of the pressure, utilizing the factor of transportation competition, which can be brought to bear upon the railroads by large shipping interests controlling a large volume of concentrated tonnage."

The railroads estimated that the rate advances they have proposed would increase their revenues from non-ferrous freight by $1,152,163, divided as follows: copper ore and concentrates, $44,799; lead ore and concentrates, $77,861; zinc ore and concentrates, $274,734; other ores and concentrates, $378,929; copper ingot, matte, and pig, $86,170; copper, brass, and bronze bar, sheet and pipe, $62,080; lead and zinc ingot, pig and bar, $216,799; and aluminum ingot, pig, and slab, $10,114. On the basis of 1933 tonnage, these estimates represent an increase in revenues of 10 per cent from ores and concentrates, 4.6 per cent from copper ingot and pig, 7 per cent from copper, brass, and bronze bar, sheet and pipe, 5.5 per cent from lead and zinc ingot,

pig and bar, and 3 per cent from aluminum ingot, pig and slab.

In the meantime, the Commission has authorized in its recent decision, effective Feb. 20, an adjustment in rates on non-ferrous scrap metals resulting, generally, in increases. The basis adopted for both copper, brass, and bronze scrap and lead and zinc scrap is 25 per cent of first class, with some exceptions, coupled with a carload minimum of 40,000 lb. in Southern, Southwestern, and Western trunk line and Eastern class rate revisions. The Commission held that no reason had been shown why the railroads should be required to grant refining-in-transit privileges on scrap metals.

Commissioner Eastman expresses doubt whether the Commission has given a square deal to shippers of scrap and refiners of secondary metals, in comparison with the primary producers. Mr. Eastman was in charge of the non-ferrous case until his appointment a year ago as Transportation Coordinator.

### Competition of Shippers

"It is true," he says, "that the shipments of scrap and secondary metals are much less concentrated than the shipments of ores, concentrates, or primary metal, and that the car loadings are not so favorable. On the other hand, there is very direct competition between the primary and secondary producers, and, after allowing for the less favorable transportation characteristics of the shipments made by the latter, there still remains the question whether the maximum reasonable rates prescribed for such shipments can be said to be fairly related to the much less than maximum reasonable rates which the primary producers in general enjoy, particularly when the refining-in-transit privileges are taken into consideration."

### Some Rates Unreasonable

Present rates on copper bullion from Arizona smelters, except Clarksdale, to Los Angeles Harbor were found unreasonable by the Commission and a rate of $8.50 per ton, minimum 60,000 lb., was applied as a maximum. No traffic moves under the higher-class rates in effect at present. The new rate may tend to divert some traffic that now moves to Texas ports. The present rate of $6 from Clarksdale to Los Angeles Harbor, the rates from Nevada, and the rate of $5.85 from Utah smelters to San Francisco and Los Angeles Harbor, from Nevada and Utah smelters to North Pacific ports, and from Montana smelters to said ports were described by the Commission as lower than maximum reasonable rates but not less than minimum reasonable rates, and so were not disturbed. The Commission remarks, however, that the level of rates to the Pacific ports in connection with the water rates via the Canal has always depressed the eastbound rail and rail-and-water rates and that, consequently, if westbound rates are further lowered, it may be forced to establish minimum rates on all this traffic to prevent a rate war.

Although the depression intervened to stay the intention of an investigation that had its beginning under the Hoch-Smith resolution in 1926, Commissioner Eastman is not satisfied with the Commission's justification of the "very low" rate of $9.50 per ton on refined copper from Montana refineries to Chicago and Kenosha nor with the like rate from Arizona on copper refined in transit at El Paso.

Reciting the circumstances which led up to the investigation, Commissioner Eastman explained that it was felt non-ferrous metals might afford a good opportunity for the carriers to secure a needed increase in revenues. Following the War these rates had been reduced much more extensively than the normal run. That the proceeding was directed primarily to such a possible increase in rates was made clear at the outset. Recognizing this, shipping interests combined to resist such an increase instead of pressing complaints against preferential adjustments, which ordinarily they would have done.

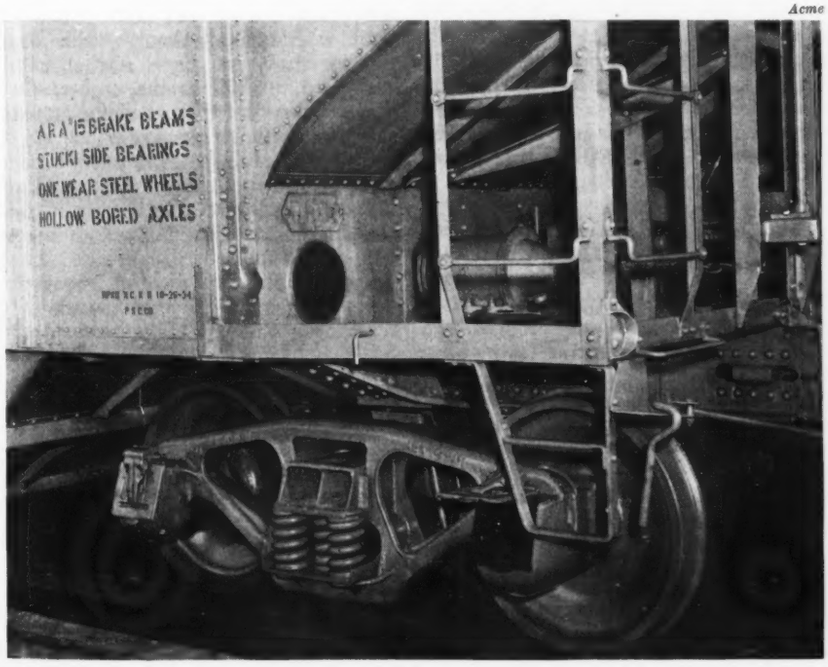
### Low Rates Readily Defended On Basis of Costs

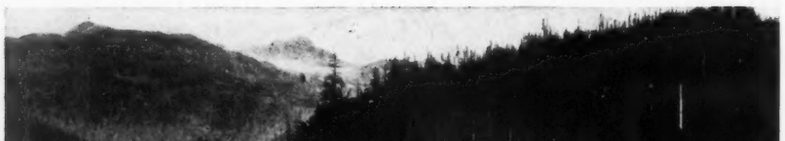
Lest there be misunderstanding, Commissioner Eastman concedes that from the standpoint of cost of service an excellent defense can be made for the low rates. The freight loads heavily and moves from comparatively few points to comparatively few destinations in comparatively large volume, but on this traffic the element of value has been ignored to much greater extent than is customary in making freight rates. Similar rates on sand and gravel would not be considered low, but the fact to which Commissioner Eastman points is that concentrates are far more valuable than sand and gravel, to say nothing of bullion or refined metal, or its manufactured products.

The reductions in rates were inspired, in part, by the serious depression in the industry immediately following the War; also by water competition through the Panama Canal in conjunction with Western Pacific's desire to secure a westbound haul, and by the threat of heavy imports now met with respect to copper by tariff protection. But at the time the rate investigation was instituted, the financial condition of the industry in general was such that, according to Commissioner Eastman, the opportunity for increases in rates appeared to be fairly open. The situation changed very quickly, however, and long before the record in the case was submitted in October, 1933, for the Commission's decision, the industry was in worse financial straits than the War left it. Nor, Commissioner Eastman remarks, has there as yet been any very pronounced recovery, and he agrees with the majority that the time is not yet ripe for any general upward revision of rates.

**Another effort to reduce transportation costs. A new light-weight hopper car. Made of high tensile-strength, corrosion-resisting steel, this car weighs 13,000 lb. less, but can handle 26,000 lb. more freight, than the old-type car. Besides low maintenance expense, it has an estimated life of fifteen years**

*Acme*





**Stockholders of Granby Consolidated last month voted directors of the company discretionary power to either shut down or continue operations at Anyox, British Columbia. Low copper prices and irreducible costs were said to account for the action taken. Above are reproductions of the company's plant and townsite at Anyox**

# Mineral Output in Canada Shows Satisfactory Increase

## Valuation of 1934 Production Is 26 Per Cent Higher Than That for the Preceding Year—Successful Marketing of Large Volume of Base Metals at Reduced Prices an Outstanding Achievement

CANADA'S mineral output for 1934 reached the satisfactory value of $278,337,000, an increase of 26 per cent over the production in 1933. This is due mainly to a decided increase in the volume of the base-metal output and the enhanced price of gold. The fuels, non-metallics, and structural materials show only small increases.

Gold production of 2,964,395 oz. is not the record, but its value, $102,-242,000 in Canadian funds, is $18,000,000 in advance of the previous year. Although by far the larger part of the gold still comes from a handful of large gold mines and as a byproduct from a few of the base-metal mines, the large number of newer and smaller mines are commencing to contribute an appreciable proportion. Several of these smaller mines now give promise of having both a long life and a much enlarged output. Silver output of 16,350,029 oz. has increased 8 per cent, and the year's average price of 47.49c. gives an increase in value of 35 per cent.

The nickel output of 130,346,400 lb. is 18 per cent above the former record output of 1929. Copper at 367,054,472 lb. is also a record, being 21 per cent above the previous high in 1930. Lead at 342,811,000 lb. is slightly above the former record. Zinc at 300,747,113 lb. exceeds the former high point by 12 per cent. In all the base metals except nickel there has been a marked decline in value due to the low prices prevailing during the year. In spite of this, almost all the base-metal mines have made a good profit.

Although the advance in the value of the gold output is, of course, independent of any marketing problem, and even though Canada's virtual monopoly of nickel puts it also in a favored position, the successful marketing of the increased volume of base metals has been due to a combination of enterprising governmental measures and skillful management by the companies. The so-called Ottawa Agreements of 1932 have permitted the Canadian metal producers to make up in Great Britain and other parts of the Empire more than they lost in the United States when the base metals of this country were practically excluded by increased tariffs. This new Empire market for the metals is based upon a mutually advantageous exchange of commodities and therefore appears to have the elements of permanency.

### *Quebec*

The high spots in Quebec mining during 1934 have been the rehabilitation of the asbestos industry, the steady progress of Noranda, and the expansion of gold mining. The adoption at the King mine of Asbestos Corporation of block caving in place of open-pit mining has not only cut mining costs almost in half but has permitted of selective mining, without which the whole Thetford asbestos camp would be doomed to fairly rapid extinction. Other open pits, not yet so deep as the old King pit, are still operating economically. Asbestos prices advanced slightly during the year and shipments increased materially.

Among the established gold mines, Beattie is making the most rapid progress at the moment. During the past year the milling process has been so improved as to extract 70 per cent of the recoverable gold as bullion, the remainder being still shipped to Tacoma as concentrate. A test plant has just been put in operation for the purpose of treating this concentrate also at the mine. In view of this solving of the metallurgical problem, preparations have been made to expand the mill beyond its present capacity of 1,100 tons daily. Though ten years' ore is in sight in the mine at this rate of extraction, extensive development is under way at the 1,000-ft. level, and the ore opened up so far is up to the average grade and in greater volume than on the upper level.

At the eastern end of the gold belt, Tiblemont Island is making the most rapid progress. A satisfactory volume of high-grade ore has been disclosed in adit workings at about 100-ft. depth, and a shaft has been started with a depth of 500 ft. as the objective. If the ore persists to this depth, a major producer will be assured.

An interesting new discovery is being opened at Rose Lake, a new gold area 70 miles north of Senneterre. Veins 1 to 2 ft. in width and extending for 500 ft. or more have averaged 1¼ oz. on sampling. The owners, Prospectors Airways, are developing the showings vigorously.

### *Manitoba*

The achievement of R. E. Phelan in re-establishing amicable relations with his force at Flin Flon after the ill-conceived strike of last summer deserves a place in Manitoba's mining annals similar to that of his feat in putting this great mine and smelter in operation in a remote wilderness in record time. Although the past year has been a difficult one for Flin Flon in

several respects, the property has responded well to careful and ingenious management and is now in a position to make a handsome profit as soon as the prices of copper and zinc return to normal.

San Antonio's 300-ton mill is still adequate to handle all the ore the mine can conveniently produce at present, but the volume of ore now in sight and indicated makes an increased output probable. Ore is also being developed rapidly on the adjoining Forty-Four property. Gods Lake Gold, in the far north of the province, is responding well to mine development on two levels, with ore running from ½ to 1 oz. across narrow and medium stoping widths. Island Lake continues to mill at 25 tons a day as a salvage operation, no new information having been gained as yet that will help to solve the problem of faulting.

## *Ontario*

Although the establishment of numerous small gold mines throughout the province has provided much interest during the past year, the outstanding event has been the rapid expansion of nickel output, and, with it, copper and the metals of the platinum group. At 130,346,400 lb., the nickel output exceeds the 1929 peak by 18 per cent. To cope with this rapid increase, which will apparently continue for some years to come, the capacity of the Copper Cliff smelter of International Nickel has been increased by 50 per cent, and the Frood mine has been provided with a new central shaft to serve the lower levels. At Falconbridge Nickel the new concentrator and small additions to the smelter permitted the production last year of 9,500,000 lb. of nickel. Although no increase is contemplated in the immediate future, the mine is to be developed at the 1,500-ft. level from a new shaft several thousand feet east of the present main shaft, where important bodies of ore have been indicated by diamond drilling. Even though a part of the current output of nickel is doubtless being used in the manufacture of armaments, as is that of every other metal, it is only a very small amount, by far the larger part being accounted for by industrial and household uses, such as high-tensile and heat-resistant steels, stainless steel, alloy cast iron, electric heating elements, and scores of other alloys.

While the three large mines at Porcupine continue the even tenor of their way, and Coniaurum shows signs of expanding also into a big mine, an extremely interesting new development is taking place in their midst. Central Porcupine Mines was formed last spring to explore the deeply covered ground between Dome and McIntyre. This ground includes a zone with structural and other features essentially the same as those that have been so productive of veins in the great neighboring mines, yet it has been, up to the present, the scene of no intensive prospecting. Early last year Frank G. Stevens, of Toronto, succeeded in combining the various small properties under one management and arranged with Coniaurum for the use of the Golddale shaft to enter the Central Porcupine ground at the 1,000-ft. level. As the deepest and most productive part of the McIntyre mine, south of Pearl Lake, strikes toward the adjoining Central Porcupine ground at this point, the chances of finding ore in this 4,000-ft. drive are good. The major opportunities lie, however, farther within the boundaries of the property and are being investigated by other means.

The 500-ton mill of Young-Davidson, Hollinger's subsidiary at Natachewan, is already treating 600 tons daily of 2-dwt. ore, and the public bullion record indicates a monthly recovery of about $50,000. Not until some months have passed can the exact relation of cost and output be established. This is the lowest-grade ore being treated in Canada.

### Official Estimate of the Metal Production of Canada During 1934, With Comparative Figures for 1933

*Dominion Bureau of Statistics, Ottawa, Canada*

| | 1933 | | 1934 | |
|---|---|---|---|---|
| | Quantity | Value | Quantity | Value |
| Gold (valued at standard rate), fine oz. | 2,949,309 | $60,967,626 | 2,964,395 | $61,279,000 |
| Estimated exchange equalization on gold produced, dollars | ..... | 23,382,611 | ..... | 40,963,000 |
| Silver, fine oz. | 15,187,950 | 5,746,027 | 16,350,029 | 7,764,000 |
| Nickel, lb. | 83,264,658 | 20,130,480 | 130,346,400 | 30,674,000 |
| Copper, lb. | 299,982,448 | 21,634,853 | 367,054,472 | 26,881,000 |
| Lead, lb. | 266,475,191 | 6,372,998 | 342,811,000 | 8,357,000 |
| Zinc, lb. | 199,131,984 | 6,393,132 | 300,747,113 | 9,169,000 |
| Other metals including cobalt, bismuth, arsenic, platinum and palladium, cadmium, selenium, radium and uranium, and titanium, dollars | ..... | 2,387,866 | ..... | 7,581,000 |
| Total | | 147,015,593 | | 192,668,000 |

## *British Columbia*

The provincial mineralogist estimates the gross value of the 1934 mineral production of the province at $41,863,150—an increase, as compared with 1933, of $9,260,478, or 28.4 per cent. This approximates the average value of the output over the past twenty years, during which period the low was in 1914, with an output valued at about $26,000,000 and the peak in 1929, with a value of over $68,000,000. During that year a record gold production was achieved, with a yield of 307,700 oz. The value in Canadian funds was estimated to be $10,480,920, or more than twice the value of last year's returns. Lead production in 1934 of 340,700,000 lb. and zinc production of 250,950,000 lb. both constitute production records, but in point of value, owing to the low market prices prevailing, they are far below the record return of 1925 in the instance of lead, and the 1926 record return in the instance of zinc. Silver, with an estimated production of 8,907,000 oz., valued at $4,197,869, shows an increase in gross value of 58.4 per cent over the 1933 returns. Copper production increased 12.3 per cent over 1933, with a volume of 49,400,000 lb., valued at $3,566,680.

In the Cariboo district, the mill at the Island Mountain mine is treating 60 tons a day. One clean-up has been made, and an unofficial estimate of the gold content of the mill feed is an ounce to the ton. The auriferous pyrite replacement deposit found at this property is being systematically explored. The early provision of hydroelectric power in this district seems to be assured, an announcement having been made that British capital about to engage in such an undertaking has applied for incorporation. Surveys have already been made, and water rights are understood to have been obtained.

In the Bridge River area, production from two new mills, the Wayside and Minto, began last month. At a recent meeting of the shareholders of Gruall-Wihksne, the recommendation of the directors to discontinue further exploration on this property, in view of the non-success of the well-planned efforts in this connection, was endorsed. The company has considerable funds remaining in its treasury, which will probably be used in the acquisition of other property offering more attractive possibilities.

At the Vidette gold mine, in the Kamloops area, a winze is being sunk to search for the vein beyond a series of faults. The mill meanwhile is operating at the rate of 33 tons per day. Total operating costs are $10 a ton with mill heads assaying 0.6 oz. of gold. The company has acquired a controlling interest in the old Monashee mine, in the Lightning Creek area, where it has developed 45,000 tons of ore of commercial grade.

At the B. C. Nickel property, diamond drilling and crosscutting continue to be carried on to explore areas indicated by a magnetometric survey to be mineralized. More than 60 individual concentrations of pyrrhotite-nickel mineralizations have been in-

dicated. The management states that considerably more development work must be undertaken before ore reserves can be calculated with any degree of accuracy. Should a large tonnage be developed, the directors are confident that a profitable operation will be assured. The company plans ultimately to erect a treatment plant, using the Hibinette process, of a capacity of 1,000 tons a day, for the recovery of the nickel, as well as sulphur, copper, cobalt, and gold as marketable by-products.

In the Nelson division, No. 10 level at the Ymir mine has been prepared for the installation of an electric haulage system. A surface tram from the portal to the new mill, which will occupy the same building as the former cyanide plant, is being installed, and mine buildings are being constructed. The power plant is to be enlarged, and adequate accommodation provided for a considerable number of workmen. At the Goodenough mine, shipments have been suspended in preparation for milling. Drifting is being continued on No. 1 level, and a raise between Nos. 3 and 4 levels will soon be completed. The No. 3 level will be used for main haulage purposes. Bunkers have been built at its portal, and a winter road has recently been constructed to the mill site.

At the Kootenay Belle property, the recently completed Hardinge-Hadsell mill is in operation on a two-shift basis and is treating 36 tons daily. Development work at this property has proved a considerable tonnage of both primary and oxidized ore.

Noble Five Mines, operating the Athabasca mine, has developed a new oreshoot, 12 in. wide over a length of 150 ft. Recent exploration has encountered the extension of one of the formerly known rich veins which had been lost by faulting. Livingstone Mining is crosscutting at the Granite-Poorman mine, aiming to intersect the Poorman and Hard-Scrabelle veins below the old workings. Some shipments of ore have been made. The company, however, is preparing to rebuild the old mill.

In the Lardeau area, the first 100-ton unit of the mill at the Meridian property is nearing completion and is expected to be in commission this month. According to the company's consulting engineer, 30,000 tons of ore is in sight at the property.

### *Nova Scotia*

Gold mining in Nova Scotia had one of the best years on record. The principal event was the discovery at the Seal Harbour mine, 110 miles east of Halifax, of substantial bodies of ore from 20 to 60 ft. in width running 5 to 6 dwt. A 25-ton test mill used to determine the value of the ore deposits yielded $35,000 during the year. Development is being pushed to 300 ft., with a view to building a 200-ton mill when a level at that depth is opened up. In December, Lacey Gold Mines, at Chester Basin, 40 miles west of Halifax, opened a new 25-ton mill to treat high-grade ore from a fissure vein, which is in clear distinction to the narrow "interbedded" veins so prevalent in the gold measures. Consolidated Mining & Smelting is investigating the possibility of large-scale mining at Cariboo, which formerly had a substantial production. Ventures Limited is testing the value of a zone 200 ft. or more in width at Goldenville, where selective mining on a small scale has already been successful.

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# Rhokana and Trepca Mines Issue Favorable Reports

*Correspondence from London*

RHOKANA CORPORATION produced 62,180 long tons of blister copper in the year ended June 30, at a total cost, including interest but not depreciation, of £23.467 per ton. It also produced 621,153 lb. of cobalt. All the copper and cobalt produced was sold. Profit for the year was £389,045, comparing with £40,863 the previous year. Trepca Mines, operating in Yugoslavia, declared to be one of the cheapest producers of lead and zinc concentrates in the world, made a net profit, after taxes and depreciation, of £160,551 during the year ended Sept. 30.

Rhokana's electrolytic refinery of 36,000 tons' annual capacity went into commission in October, only sixteen months after work on it was started. Though cobalt is being recovered from the concentrates quite satisfactorily in the smelter, a small electrolytic refinery was erected for the purpose of making copper-free ferrocobalt or pure cobalt on an experimental basis. This plant was continued in operation with satisfactory results.

Last year was one of relatively heavy construction expenditure. Rhokana has issued and sold £1,500,000 of 5½ per cent redeemable preference shares; these were offered at 5 per cent premium and were oversubscribed. The capital thus raised will be used to pay off about £490,000 of loans and to develop the Mindola section of the N'Kana mine and for plant extensions such as will enable the company to produce at the rate of 120,000 long tons of copper annually by the end of 1937. This is the plan, but the report states that it may be delayed in the event of a curtailment of production agreement.

The grade of the ore treated last year was 3.80 per cent copper, of which 0.21 per cent was oxidized copper, being appreciably lower than the year before, and below the average of the mine. During the year the room-and-pillar system of mining was discontinued, and all stoping is now being done by the sublevel method. Minor alterations materially increased the milling capacity and efficiency. The 133,091.52 short tons of concentrate produced averaged 52.52 per cent copper, milling recovery being 87.1 per cent of all the copper in the ore.

The N'Changa division, N'Changa and the N'Changa-West mine, was maintained on a caretaking basis. Prospecting was continued, 780 square miles of the concession being traversed and mapped, but nothing of outstanding importance appears to have been discovered. Considerable trenching was done, however, on the gold-copper occurrences in the western part of the concession. This work revealed quartz veins too narrow to be worked profitably, but further work will be done on a silicified zone which shows 1.1 dwt. of gold and 2½ per cent of copper at the surface, with a view to determining the character of the mineralization at depth.

Trepca Mines, during the year ended Sept. 30, milled 589,081 metric tons of ore averaging 8.85 per cent lead, 8.56 per cent zinc, and 2.958 oz. of silver per ton. Of the lead, 95.82 per cent was recovered in concentrate, against 95.59 per cent the preceding year, and of the zinc 92.09 per cent, against 90.48 per cent. The concentrates assayed in the first case 79.23 per cent lead and 1.11 per cent zinc and averaged 24.895 oz. of silver per ton; in the second instance, 50.41 per cent zinc, 0.60 per cent lead, and 0.350 oz. of silver per ton. Operating costs, including London and general expenses, were 15s. 7d. per ton of ore, this comparing with 14s. 4d. the preceding year, the increase being chiefly due to the rise in the price of gold, to which the Yugoslav dinar is still linked.

The ore deposit being mined is a large one. About 1,800,000 tons has been mined so far from above the 610-meter level, and, without including any ore below that depth, reserves were calculated at 2,500,000 tons when the year ended. Diamond drilling has proved the continuance of the deposit for at least 300 meters below the 610-meter level, this being over half the known extent of the ore from outcrop to depth, the values

below apparently being about the same in lead, very much lower in zinc, and over twice as high in silver.

In many respects operating results have been better than originally expected. The mill was designed for a capacity of 22,500 tons of ore monthly, yet for some time past over 50,000 tons a month has been treated. A. Chester Beatty, chairman, said at the annual meeting: "We would willingly cooperate in any reasonable scheme designed to prevent the accumulation of stocks and so to maintain stable prices."

# Further Nationalization of Mining Looms in Mexico

**President Cardenas States in His Inaugural Address That He Will Further the Program Initiated by His Predecessor, President Rodriguez —Labor Employed by the Industry to Be Reorganized**

NATIONALIZATION of the mining industry, which was started during the administration of his predecessor, President Rodriguez, will be furthered during his regime, which will last until Nov. 30, 1940, General Lazaro Cardenas intimated in an address at his inauguration as 45th president of Mexico.

"The mining industry has great resources and a long tradition, marked by a series of flourishing communities, as well as those that are either in ruins or are decaying," President Cardenas said. "No permanent benefit has been left thus far, because the exploitation of the mining industry has always been in the hands of a priviliged few who have had the opportunity of amassing great fortunes and of building monopolies.

"Confronted by this situation, the State will continue to take the necessary measures to organize the present industry and integrate it with the future industry. This transformation is not precisely of a technical nature, but, above all, it will be necessary to reorganize the labor that is employed by the mining industry."

Four gold and silver producing mines in the Huautla zone, Tlalquiltenango municipality, Morelos, have been put into operation by their owner, Brig.-Gen. Jose Cruz Rosas. . . . The Ministry of National Economy has organized a cooperative society of miners employed by various companies in the Pachuca, Hidalgo, zone and a similar unit of miners of Jerez, Zacatecas. The latter group are working a large manganese deposit near Jerez and have contracted to sell all their output to the Monterrey Iron & Steel Works, of Monterrey, Nuevo Leon, Mexico's greatest enterprise of the kind.

Increased demand for silver at higher prices has prompted individuals and companies to arrange for the reopening of long-abandoned mines in southeastern and northwestern Guanajuato. Most of this work is in progress in the Melladito, El Nayal, El Durazno, and Nueva Luz zones of the Sierra de Santa Rosa, and in the El Monte de San Nicolas, El Cedro, Valenciana, and Mellado regions.

Cia. Minera La Quimica y Anexas, has resumed operation of its 30-ton daily capacity flotation plant on the El Malacate tract, Sultepec municipality, Mexico, on a 60 per cent basis, but expects to operate it at full capacity early in 1935. . . . Cusi Mexicana Mining, operating at Cusihuiriachic, Chihuahua, has eliminated labor difficulties by granting wage increases of from 10 to 20 per cent. . . . Negociacion Minera de Santa Maria de la Paz, operating in San Luis Potosi, has eliminated labor difficulties by also making new contracts with its workers.

American Smelting & Refining ended a five-hour strike of about 2,000 workers at its Avalos unit, Chihuahua, called as a protest against the company's refusal to raise the unit's minimum daily wage from 1.50 to 3 pesos (about 40 to 80c.) by agreeing to fix 2.75 pesos a day as the lowest wage. . . . Exploitation of the Joe tract, Arizpe municipality, Sonora, and the Niño Fidencio property, Guadalcazar municipality, San Luis Potosi, has been started.

The Chihuahua legislature is considering a measure presented by Governor Rodrigo Quevedo calling for an agreement between the state and federal governments for reviewing mining tax measures, with a view to increasing these imposts. Governor Quevedo contends that now that the mining industry in Chihuahua is prosperous, it is but fair that the mining companies pay higher taxes to the national and state treasuries than they did during the depression. Expectations are that the measure will be approved and that it will be adopted by other states.

At the ministry of National Economy plans are being developed for the establishment of a metal-treatment plant with flotation and cyanuration facilities for prospectors and independent miners of Sonora, and for the organization of these workers into cooperative societies that will be supervised by the federal government.

American Smelting & Refining has established a 200-ton daily capacity cyanuration plant at Parral, Chihuahua. . . . Southwestern Exploration is completing the installation of a 150-ton capacity flotation plant at Santa Barbara, Chihuahua. . . . Cia. Minera del Monte has put into service a 30-ton flotation plant at Tetipac, Guerrero, and is arranging for installing a similar plant at San Miguel, in that State. . . . Mexican Candelaria, operating at Contra Estaca, Sinaloa, has increased the wages of all its employees and has established a minimum daily wage of 2.75 pesos for mine workers. The Sinaloa law prescribes 2 pesos as the lowest day's pay for these workers.

**Completed cut-off wall of Cerro de Pasco Copper Corporation's hydroelectric project under way in Peru. Construction of the dam, 220 ft. high, will be completed by the middle of 1936. A 7,000-ft. pressure tunnel has already been completed**

*(Continued from page 38)*

A diamond-drill hole, driven by American Smelting & Refining, has struck a 2-ft. streak of copper-gold-silver ore 500 ft. west of the 1,500-ft. level of the new triple-compartment shaft sunk from the Armstrong tunnel level at Bingham. The showing is believed to be one of the A-B-C limestones being developed at great depth. American Smelting & Refining Company has a lease on the lower levels of Utah Metal & Tunnel and parts of the Utah Copper mine at depth.

Ore has been discovered above the Martin tunnel of the Queen of Sheba mine, 15 miles south of Gold Hill, in western Tooele County, according to N. J. Nielson, business manager. The company is preparing to ship concentrates to a Utah smelter.

Sinking operations in the Copperhead shaft of the Utah Central property in the Drum Mountain district, 35 miles west of Delta, have been suspended at a depth of about 750 ft.

Leasers are operating in the Ibex group. Operations on the property have been financed by Engineers' Exploration & Mining Corporation, which acquired control of the Utah Central Company this year.

## *Montana*

Butte Copper & Zinc, subsidiary of Anaconda Copper Mining, has resumed work at its Emma mine, in Butte, after a shutdown for heavy repairs to the hoisting engine. The property will soon produce its regular complement of zinc-lead-silver ores and also has several orders for pink manganese.

Anaconda Copper Mining has 3,500 men at work at its Butte mines, the largest in a number of years. Employees are working on a basis of 40 hours per week. There still are quite a number of idle miners in Butte, and these will be given work before hiring labor from the outside.

Roy Miller, Inc., has reopened the Jib mine, at Basin, Jefferson County, and is drifting on ore on the 200 level of the East Katie property. Twenty men are employed.

Basin Montana Tunnel plans to increase the capacity of its flotation plant to over 200 tons per day immediately. This work is being done under the direction of George G. Griswold, Jr., Butte metallurgist, formerly with the W. A. Clark and Anaconda interests.

Glengarry Mining, with mines at Cooke City, placed its new 35-ton flotation pilot plant in operation on Dec. 14.

Winston Brothers are reported to have extracted $93,000 in gold from placers on Prickly Pear Creek, 6 miles east of Helena, which were believed to have been exhausted by the early miners.

## *Washington*

Two diamond drills have been in constant operation on the property of Metaline Mining & Leasing since negotiations for control of the company were concluded in 1933 by American Zinc, Lead & Smelting, according to a recent statement by H. Lewis Schermerhorn, president of the Metaline company. The contract of American Zinc, Lead & Smelting with Metaline Mining & Leasing is understood to involve the purchase of 51 per cent of the stock of the latter company and to provide that the name and identity of Metaline Mining & Leasing would not be disturbed.

## *Idaho*

The five claims of Elgin & Ogden Mining in the Big Creek area, and the Amy-Matchless property on Pine Creek, as well as the adjoining Olympic group of claims, were recently acquired by a syndicate of Chicago and Cleveland interests. J. R. Foster, representing the syndicate, stated that $30,000 worth of machinery had been ordered with which to start operations on the Elgin & Ogden property. Tunnels and shafts on both the Amy-Matchless and Olympic groups would be reopened, he stated, and the 100-ton concentrator on the former property overhauled and equipped with a flotation plant.

Empire Silver, a newly organized company, has taken over the Nellie property, in the Osburn district. A development program begun a short time ago will be carried forward by the new company. The program includes the driving of a drift from the Silver Summit tunnel to encounter ore showing on the upper levels and in a shaft sunk 170 ft. on the vein. E. S. Crane, of Spokane, who has long been associated with operations on the property, is one of the principals of the new company.

Hecla Mining announced recently that the shaft at the Polaris mine had reached the 670-ft. level. A crosscut to the vein will be made from this level; then the work of extending the shaft to a depth of 1,000 ft. will be resumed.

The mill of Orogrande-Frisco, at Orogrande, is reported to be crushing 200 tons a day, on a single shift basis. Operations are soon to be increased to full time and the quantity of rock handled 400 to 500 tons a day.

## *Michigan*

Calumet & Hecla Consolidated has purchased a controlling interest in Ishpeming Gold Mining, lessee of the Ropes gold mine, situated 5 miles northwest of Ishpeming. Michigan's first gold mine was started on the Ropes property in 1882. Calumet & Hecla plans to start exploration with a view to developing the so-called Serpentine range on the property. One company is now engaged in mining and milling quartz in that district, and several small bullion shipments have been made. Openings on the Serpentine range are comparatively shallow. Geologists regard the prospects with favor and recommend exploration at greater depth.

The late Julius Ropes, an Ishpeming chemist, first recognized the possibilities afforded by the Michigan gold field, in 1880, and formed a company to finance the undertaking. A shaft was sunk, a small mill erected and the first milling done in 1882. Operations were later expanded and the mine operated for a period of fifteen years. More than $600,000 worth of gold and silver were mined before work was abandoned, owing to financial troubles. The shaft at the Ropes mine was sunk 960 ft. It possessed solid walls that needed little or no timbering and was, to a large extent, free of water.

## *Colorado*

Eleven and one-half months' actual mine production with an estimate by the mine operators and smelters for one-half of December indicates that the output of gold, silver, copper, lead, and zinc from Colorado ores and gravels in 1934, in terms of recovered and estimated recoverable metals, was 317,214 oz. of gold, 3,389,552 oz. of silver, 11,040,000 lb. of copper, 8,296,000 lb. of lead, and 1,505,000 lb. of zinc, according to C. W. Henderson, of the United States Bureau of Mines. These figures are to be compared with 242,828 oz. of gold, 2,186,140 oz. of silver, 9,667,000 lb. of copper, 4,803,000 lb. of lead, and 2,569,000 lb. of zinc produced in 1933.

Gold production from the Cripple Creek district increased from 109,868 oz. in 1933 to 124,234 oz. in 1934. New crushing equipment and enlargement of cyanide tanks at the Golden Cycle 1,200-ton roast-amalgamation-cyanidation custom mill, at Colorado Springs, allowed it to operate at an average of 1,244 tons daily (over 1,500 tons a day were treated in October), principally on Cripple Creek sulphotelluride ores. All Cripple Creek ores are treated at this mill. During 1934 the 300-ton selective flotation mill, added to the Golden Cycle equipment in November, 1929, was used to treat low-grade Cripple Creek ores and custom gold-silver-lead ores from Boulder, Clear Creek, Gilpin, Lake, and other counties in Colorado and small lots from northern New Mexico and Wyoming, the lead-copper-iron-gold-silver concentrates going to the Leadville smelter and the tailings from the flotation machines going direct into the cyanide circuit. A new 450-ton flotation mill was almost completed by the end of the year near the sampling and crushing houses. The old flotation units will be moved to the new building.

# PERSONAL ITEMS

**Fred E. Johnson** has left Arizona Consolidated, Humboldt, for Montana Mines, Ruby, Mont.

**E. W. Seckendorff** has joined the technical staff of Battelle Memorial Institute, at Columbus, Ohio.

**Harold G. Mitchell** is now superintendent and manager of Pacific States Mines, Inc., at Jacksonville, Ore.

**William S. Barquist,** consulting mining engineer, has opened an office at 2207 Smith Tower, Seattle, Wash.

**F. H. B. Leggett** is leaving London to take charge of the Sanza Concession operations of Kentan Gold Areas, Ltd.

**Gloyd M. Wiles** has been appointed assistant superintendent of Park City Consolidated Mines Company, at Park City, Utah.

**Forest Mathez,** Salt Lake engineer, has taken charge of operations in the Aurum Gold mine, at Gold Hill, Utah, as superintendent.

**Merle H. Guise,** of New York, is at Globe, Ariz., preparing to make examinations of gold properties of the Payson district of Arizona.

**Howard Coonley,** president of the Walworth Company, has been reelected president of the American Standards Association for 1935.

**Charles A. Banks,** managing director of Bulolo Gold Dredging, Ltd., left San Francisco early in December for Australia and New Guinea.

**George W. Peters,** formerly mill superintendent for Arizona Consolidated, has accepted a similar position with Sterling Gold at Cordes.

**J. Bremner,** of the metallurgical staff of Wiluna Gold Mines, Ltd., has been appointed metallurgist of Lancefield Gold Mines N.L., Laverton, W. A.

**R. J. Parker,** assistant to the managing director of Roan Antelope Copper, Mufulira Copper, and Rhodesian Selection Trust, has gone to Africa.

**Sigmund Solomon,** of New York, has been appointed by President Roosevelt to be superintendent of the United States assay office at New York City.

**Robert Clark** has been appointed consulting engineer for Morning Star (Fairview) Gold Mines, Ltd., operating in the Fairview district, in British Columbia.

**Ali A. Hassan,** consulting geologist and mining engineer, of New York City, has recently been in Canada on an inspection tour of Ontario and Quebec mines.

**Ralph J. Orynski,** mill superintendent, Mexican Candelaria Company, has returned to Contra Estaca, Sin., Mexico, after spending a few days in San Francisco on business.

**A. C. Fieldner,** chief engineer, Experiment Stations Division, United States Bureau of Mines, has been elected junior vice-president of the American Society for Testing Materials.

**C. E. Prior,** previously general manager of Wiluna Gold Mines, Ltd., Wiluna, is now managing director of the company, with headquarters at Perth. **H. H. Carroll** succeeds Mr. Prior.

**Captain E. W. Ellis,** metallurgist, formerly with Idaho Maryland Mines Company, Grass Valley, Calif., has become mill superintendent of Empress Gold Mining Company, Grass Valley.

**Harlow Hardinge** has recently returned from an extended trip into Canada, where he attended the starting up of the Hardinge-Hadsel mill at the Granada Gold Mines, Limited, Rouyn, Quebec.

**Judge John W. Haussermann**

**Judge John W. Haussermann,** president and general manager of the Benguet Consolidated Mining Company, is leading the fight against unfavorable legislation which threatens the life of the gold-mining industry in the Philippine Islands. Benguet has control of Balatoc Mining Company, one of the richest gold mines in the world.

**H. L. Tamplin** is now designing engineer in the Toronto headquarters of the General Engineering Company, Ltd., Canada, having recently left the International Nickel Company, Copper Cliff, Ontario.

**C. L. Hershman,** who resigned as manager of Granada Gold Mines, Ltd., on Oct. 8, 1934, has been retained by Buffalo Ankerite Gold Mines, at South Porcupine, Ont., and Marbuan Gold Mines, as consulting engineer.

**S. J. Clausen, Jr.,** of the exploration department of Howe Sound Company, has closed his office at Reno, Nev., and will again make his headquarters at Santa Monica, Calif., where his address is 543 Fourteenth St.

**T. D. Harris,** general manager for Bulolo Gold Dredging, New Guinea, is in the United States. The four boats on the company's property are digging more than 900,000 cu.yd. a month and the new power plant is finished.

**John Carter Anderson,** consulting mining engineer, has returned to his home in Beverly Hills, Calif., after an extended examination of quartz and placer mines in southwestern Oregon and northern California.

**N. N. Babcock** has severed his connection with Bald Mountain Mining Company, of Trojan, S. D., and is now junior metallurgist in the research department of Cerro de Pasco Copper Corporation at Oroya, Peru.

**O. H. Woodward,** general superintendent of the Broken Hill Associated Smelters, Port Pirie, since 1928, has accepted the position of general manager of North Broken Hill, Ltd., in succession to the late Cyril Emery.

**P. H. Reagan,** mining engineer, of the Fresnillo company, is supervising operations for his company in the Chalchihuites section, Zacatecas, Mexico. Mr. Reagan was formerly with Guggenheim Brothers, in South America and Mexico.

**Max Playford,** assistant manager of Great Boulder Proprietary, Ltd., has been appointed chief metallurgist of Wiluna Gold Mines, Ltd. Mr. Playford was formerly mill superintendent of Mount Lyell Mining & Railway Company, Ltd.

**W. H. Fowler,** a graduate of the University of Arizona, is now mill superintendent for Molybdenum Gold Mining Company at Mammoth, Ariz. **C. A. Bilson,** formerly with the Christmas Copper Company, is master mechanic for the company.

**F. R. Weekes,** accompanied by his associate, **E. P. Crawford,** has returned to his San Francisco office from a trip of inspection to their Yankee Girl gold mine, at Ymir, B. C. They expect the new 100-ton mill will be in operation early this year.

**Frank Cameron** spent a few days in New York recently while en route to London. From London he went by plane to East Africa, where he assumed the position of manager of East Africa Goldfields, Ltd., at Meeya, in Tanganyika Territory.

**T. T. Airey,** formerly with Britannia Mining & Smelting Company, and later at the Noranda mill, has joined the organization of the General Engineering Company, Ltd., Canada, as sales engineer. His headquarters will be at Noranda, Quebec.

**J. P. Dyer,** works manager of Nichols Copper Company at El Paso, Tex., has been appointed by the National Labor Relations Board to serve on the Regional Labor Board for the Thirteenth District, representing Industry in cases arising in and near El Paso.

**C. E. Davies,** since 1931 executive secretary of the American Society of Mechanical Engineers, has been appointed national secretary of the Society. He succeeds Dr. Calvin W. Rice, whose death last October terminated 27 years of service as national secretary.

**Robert D. Hoffman** is engaged in mine-examination work in western Ontario and will return to New York soon after the first of the year. **Arnold Hoffman** has just returned to New York after a six weeks' trip in the West examining gold properties in Arizona and California.

**Albert B. Williams, Jr.,** who has been supervising a number of prospects in the Nacozari district, Sonora, Mexico, has accepted a position as mining engineer with the American Smelting & Refining Company and has been assigned to the company's Santa Eulalia, Chih., plant.

**Tasker L. Oddie,** president of the Gold Mining Association of America, San Francisco, and formerly United States Senator from Nevada, was recently in Spokane, where he addressed the members of the Northwest Mining Association on the subject of federal loans to the mining industry.

**Gustave Reinberg,** research engineer for Cerro de Pasco Copper Corporation, returned to Oroya, Peru, early in December, after spending some time in the United States. **Walter C. Smith,** metallurgist in New York for the same organization, sailed with Mr. Reinberg for a short stay in Peru.

**Carl J. Trauerman,** Butte mining engineer, president of the Mining Association of Montana, returned from Minneapolis the middle of December. During his absence he was appointed by Governor Frank H. Cooney to represent Montana at the recent meeting of the American Mining Congress at Washington, D. C.

**J. M. Garza Aldape** has been appointed federal mine inspector by the Mexican Government, with official residence al Morelos 812, Chihuahua, Chih. He had formerly been at Guanajuato, Gto., as consulting mining engineer and professor of mining at the Guanajuato State School of Mines. Mr. Aldape is a graduate of the Colorado School of Mines, at Golden, Colo., and of the Stevens Institute of Technology at Hoboken, N. J.

**William B. Daly,** general manager of mines of the Anaconda Copper Mining Company, recently made addresses before the Butte Rotary Club and the student body of the Montana School of Mines, his subject being "A Trip to Africa." He described a journey made through the mining districts of the Dark Continent a few years ago, accompanied by **Reno H. Sales** and **F. Arthur Linforth,** respectively chief geologist and assistant chief geologist of the Anaconda company.

**Lewis W. Douglas,** who resigned as Director of the Budget on Sept. 1, has been elected vice-president and a director of the American Cyanamid Company. Mr. Douglas was graduated from Amherst and from the Massachusetts Institute of Technology, where he studied metallurgy and geology. His family has been active in developing the copper-mining industry of the West. His grandfather was founder of the Phelps Dodge Company of Arizona and his father is president of the United Verde Extension Mining Company of Arizona.

**Ivan E. Goodner** is spending two months at New York and Washington in connection with the plans for erection of a 100-ton mill at the Idaho mine, near Durango, Colo., half of the capacity to be leased to the adjoining Jumbo mine. He is also presenting to the Federal Relief Administration a proposal for government erection and operation of a custom milling plant to meet the needs of the low-grade mines in the Rico-Silverton-Mancos-La Plata districts. The opening of these properties would take several thousand men off the relief rolls.

**R. E. Barthelemy** has been appointed manager of Société d'Etudes & d'Exploitations Minières de l'Indochine at Phontiou, Indo-China. He has completely remodeled the milling equipment and flowsheet of the company's mill, installing Allis-Chalmers and Dorr machines. Capacity has greatly improved, and the company is now one of the largest tin mines in the world. Metal extraction is more than 1,500 tons annually and milling capacity more than 800 tons daily. Mr. Barthelemy has been granted a United States patent, No. 1,950,537, for his new flotation process.

# *OBITUARY*

**William Walter Hudson,** well-known mining engineer in the Western states, died at Salt Lake City on Nov. 30.

**Robert C. Canby,** mining and metallurgical engineer, died at Wallingford, Conn., on Dec. 23, at the age of 83.

**George Gandsey,** 42, mine superintendent, Wheeling Steel Corporation, died on Dec. 7 at Mountain Iron, Minn.

**Dr. Frank Carney,** professor of geology at Baylor University since 1929, died at Waco, Tex., on Dec. 13, at the age of 67.

**William P. Morrison,** mining engineer, long associated with Kennedy Mining & Milling Company, died recently at Jackson, Calif., aged 44.

**Irving Howbert,** long identified with mining in Colorado, and former operator of the Robert E. Lee mine at Leadville, died at Colorado Springs on Dec. 21. He was 88 years old.

**Arthur J. McQuatters,** well-known mining and lumber operator in he southwest and Mexico, died at Albuquerque, N. M., of angina pectoris, on Dec. 8. Mr. McQuatters was born in 1873 in Ellis County, Tex. He was the president and organizer of the Alvarado Mining & Milling Company, the Parral & Durango Railway, and various other enterprises in old Mexico.

**Axel O. Ihlseng,** mining engineer, civil engineer, and metallurgist, died at Lancaster, Pa., on Dec. 9. Mr. Ihlseng was graduated from Columbia School of Mines in 1877. He operated for twenty years in the Joplin district of Missouri and during the World War was a government consultant on minerals. Mr. Ihlseng invented concentration improvements in the handling of mixed lead and zinc ores. He was a member of the A.I.M.E. and of the Columbia University Club, New York.

**William Watts Macon,** for 23 years identified with the editorial department of *The Iron Age,* during 14 years of that period as managing editor and editor in chief, died on Jan. 1 in New York. He was born in New York City, May 19, 1875, and was graduated from Cornell University as a mechanical engineer in 1898. At Cornell he was editor of the *Sibley Journal of Engineering* and upon his graduation from college was associated with the editorial department of the *Engineering Record* from 1898 to 1905. From 1905 to 1911 he was editor of the *Metal Worker,* following which he began his long period of service with *The Iron Age.* Early in 1930 he was made editor in chief, but after an exceptionally severe illness retired from that position at the beginning of 1932 and became consulting editor, in which capacity he served until the time of his death.

## *An Appreciation of Caetani*

*The Editor:*

I am enclosing herewith a copy of a letter received from Lionel Lindsay, who is a cousin of the late Prince Gelasio Caetani. This letter will doubtless be of interest to your Western readers, as Prince Caetani had many friends in the mining fraternity, and of course they were not confined entirely to the West.

I am not surprised that his cousin attributes Caetani's death to overwork, for a recent letter from Caetani himself told me of the many lines of endeavor he was pursuing in Italy.

ALBERT BURCH.

*Black Oak Ranch, Medford, Ore.*

Mr. Lindsay's letter to Mr. Burch follows:

Hambrook House, Chichester.
Oct. 23, 1934.

Dear Burch:

I feel sure you would like to have a line from me on this unhappy day, which sees the end of our good friend Gelasio, although I cannot add much to what you will already have heard. For some time he had been rather ill, and the nature of his illness must have been a puzzle to his doctors, so many have been the different accounts; but all through the year he had followed his inveterate habit of overworking, until about ten days ago he became really bad—when they thought it was meningitis. He would have been impatient of a long illness, yet I feel his time had not really come. It was only about five weeks ago that his mother died. We shall all be the poorer for his loss, as will his country, too.

I am sure he would have liked to have sent a *Vale* to the Pacific Coast and to his old associates.

With kindest regards,
Sincerely yours,
LIONEL LINDSAY.

## *An Appreciation of Walter A. Perkins*

The many friends and associates of Walter A. Perkins were shocked to learn of his sudden death from embolism at Chuquicamata, Chile, on Nov. 7. Mr. Per-

kins, only a few days before, had returned from his vacation in the United States, and although he became ill on the trip south, on his arrival in Chile he apparently did not consider his condition to be serious, for he continued on to Chuquicamata. He had just entered the hospital for an examination when his death occurred.

Walter A. Perkins was born at Los Angeles on April 25, 1886. He was educated at the Universities of Utah and Southern California. He received his first experience with the A.S.& R. Company at the Garfield smelter, and soon thereafter joined the staff of Nevada Consolidated and was located first at the smelter at McGill and then at the mine at Ruth. Even in this early work he exhibited a characteristic that was to be invaluable to him in later life—an ability to understand the viewpoint, and to gain the sympathy and cooperation, of labor, which was composed of many nationalities of differing traits and characters.

In March, 1911, he was selected by the general manager of Nevada Consolidated as one of a group of three engineers to be sent to the Braden Copper Company in Chile. At Braden he was engaged in the plant construction work. However, owing to his experience in churn drilling at Ruth, he was selected to carry on prospect drilling work for M. Guggenheim's Sons at Andacolla, near Coquimbo, in Chile. In April, 1912, he was transferred to Chuquicamata, where the Guggenheims and A. C. Burrage had just secured options on that great copper deposit. Mr. Perkins was thus at Chuquicamata at the time of initiation of development work by Chile Exploration Company. He had charge of the prospect drilling and soon thereafter was also given charge of the mining claims. In October of 1915 Mr. Perkins was appointed business manager, on account of his thorough knowledge of the property and also his thorough knowledge of the Chileans. In 1917 he was made assistant to the general manager and held this position until the time of his death. His work entailed many trips in the pampa and in the cordillera in connection with the examination of prospects, investigation of water rights, the acquisition and operation of sulphur mines on the high volcanoes, and similar duties. He was recognized as an expert in desert and mountain travel. His men were devoted to him, and his willingness to share their hardships with good cheer won their respect and kept them faithful and loyal. He possessed a charming personality which endeared him to all of his associates, both Chilean and North American. To all the veterans of the Chilean camps, as well as to many casual passers-by, the death of "Perk" will come as a great shock. He is survived by his wife, Dorothy Berry Perkins, and three children. Mrs. Perkins is the sister of Edwin S. Berry.

His death is a great loss to the Chile Exploration Company. Measured in the terms of his service, he was the oldest member of the staff of that company in Chile; the only one, in fact, who had served the company since the inception of its operations in Chile.

H. C. BELLINGER,
Vice-President,
Chile Exploration Company.

## *A Mining Engineer Educates Young Hondurans*

*The Editor:*

The social aspects of the mining engineer's work in isolated localities have frequently been the subject of comment. In this connection it seems pertinent to call attention to the unusual activities of one engineer who has always had a deep interest in people and their development.

In 1904, Harold I. Brosius received the first degree of metallurgical engineer granted by the School of Mines and

**Harold I. Brosius**

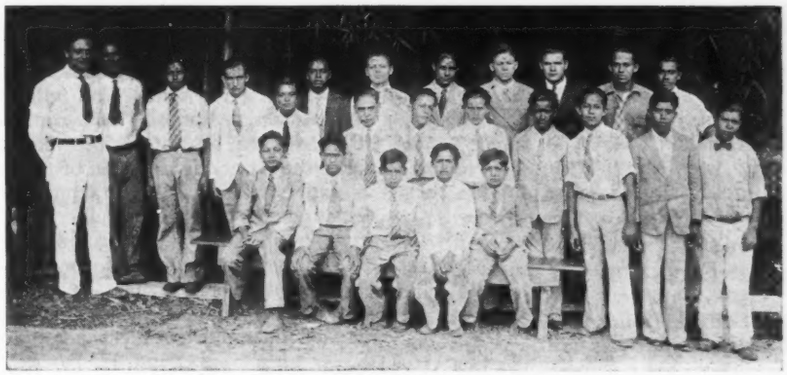
Metallurgy of the University of Minnesota, Minn. During the next six years he engaged in mining and metallurgical work in Montana, Colorado, New Mexico, Washington, and Alaska. In 1910 he went to Honduras, Central America, to examine a mining property. He became so enraptured with the country that he decided to make it his home.

The elevation of the central part of Honduras is from 4,000 to 5,000 ft. above sea level, and, although located in the tropics, the temperature never exceeds 80 deg., or falls below 40 deg., the year around. Mr. Brosius secured a tract of land at Minas de Oro, which he began to farm with the help of natives. In 1912 he imported some thoroughbred Holsteins from Minnesota, and he now has a herd of 500 "grade Holstein" cattle, and not fewer than 100 near-by farms have "herd sires" from his original stock.

As he became more interested in the country and its people Mr. Brosius began teaching some of them English and also some of the sciences. By selecting the most promising boys in the district he has gradually increased the number working for him and attending school until he now has 24 boys from 11 to 22 years of age living on his ranch. These boys do all the work on the ranch for their room and board, clothing and schooling. The course of instruction includes English, mathematics, physics, chemistry, mineralogy, geology, and various agricultural subjects. In recent years he has sent two of his students to the Agricultural School at Minnesota. One of these, Antonio Fernandez, returned to Honduras after making an excellent record at Minnesota and is now in turn teaching at the ranch school.

Frequently, Mr. Brosius receives requests for a young man to become manager of a dairy farm. He offers this position to one of his older students, and in this manner the fame of his students and school is spreading. The result is that such a large number of boys have applied to Mr. Brosius for permission to become one of his group of students that he has just completed a new school building and will open a boarding school for 80 boys. Antonio Fernandez will be principal and the course will run for four years. The charge of $20 a month will cover all costs, including tuition, room, and board. The object of the course will be to educate boys to be teachers in Honduras, and it will also serve as a preparatory course for colleges in the United States.

While exercising his hobby of developing men who will leave a permanent mark on the intellectual life of Honduras, Mr. Brosius finds time to follow his own profession of mining. He recently visited the University of Minnesota for the first time in twenty years, and during his stay in this country completed the sale of a gold property to a group of Los Angeles capitalists. Receipts from his mining ventures have financed his ranch and school.



**A group of students at Mr. Brosius' school**

WALTER H. PARKER.
*School of Mines and Metallurgy,*
*University of Minnesota,*
*Minneapolis, Minn.*

# NEW BOOKS

## Copper in Iron

ALLOYS OF IRON AND COPPER. *By J. L. Gregg and B. N. Daniloff. Alloys of Iron Research Monograph Series. Published for The Engineering Foundation by McGraw-Hill Book Company. Pp. 454. Price, $5.*

In view of the growing importance of copper-bearing iron and steel, this book, the fourth in Alloys of Iron Research Monograph Series, is very timely. Of particular interest are the numerous investigations brought about by the realization that small quantities of copper tend to decrease the loss of iron by atmospheric corrosion. Over 600 articles have been abstracted in the preparation of the volume and much heretofore unpublished material has been made available. Frequent references are also made to patents, although no systematic study of the patent literature has been undertaken.

## Potash in Africa

GEOLOGY OF VOLCANIC AREA OF BUFUMBIRA, SOUTHWEST UGANDA. *By A. D. Combe and W. C. Simmons. Memoir No. III. Geological Survey of Uganda, Entebbe, Uganda. Pp. 150. Price 15s.*

To quote from the preface by E. J. Wayland, Director, the Birunga lava field, as the volcanic area as a whole is called in this memoir, is of great importance. The lavas provide one of the largest leucite-bearing areas (and therefore perhaps one of the largest potash reserves) in the world. In the northern part promising prospects of gold have been found. Commercial interest has already been aroused in the leucite. Some gold (610 oz.) has already been exported.

## Stone Facts

THE STONE INDUSTRIES. By Oliver Bowles. McGraw-Hill Publishing Company, Inc., New York. Pp. 519. Price $5.

In presenting this work, Dr. Bowles has not only brought forward the most important contribution to the literature on the subject that has appeared in nearly 25 years, but has produced an interesting book. The most recent previous work was that of Dr. George P. Merrill, "Stones for Building and Decoration," published in 1910. During the intervening period great strides have been made in the stone industries, in volume, in the value of their output, and in the technical methods and equipment used. Their importance is indicated by the operation of about 2,800 mines and quarries, the employment of 90,000 men, and an annual output which from 1927 to 1931 averaged more than 176,500,000 tons, valued at $216,300,000.

This book covers all of the more important branches of the industry, including dimension stone, crushed rock of various kinds, cement rock, road metal, lime and limestone, and others too numerous to be detailed in this review. Among the chapters are those on "Factors Governing Rock Utilization, Prospecting, and Development," and "Deterioration, Preservation, and Cleaning of Stonework," in addition to others devoted to the occurrence, geology, production problems, and treatment of individual rock elements—limestone, sandstone, granite, marble, slate, soapstone, builders, foreign building and ornamental stone, and various other rocks and minerals utilized for these purposes. A description of the important stone and rock deposits in each state is given and voluminous data on uses, requisite physical qualities, marketing problems, transportation, storage, cost of production, milling methods, and problems of waste and its utilization are presented. Each chapter ends with a bibliography.

Engineers and geologists other than those directly engaged in this work will find the discussions of quarrying and milling methods of particular interest. Quarry development and mining methods are often controlled by the geological characteristics of the mass. In many places, mining is, in effect, the first element of the milling step, requiring the selection of mining equipment that will be most likely to reduce the mill work by providing smooth, uniform faces. Architects will find much information to aid in the economic selection of rock and in understanding the characteristics of the products of various quarries. The stone industries should provide an increasingly important field for the employment of technical men, and the volume will be found useful by students interested in exploring these possibilities.

SAMUEL H. DOLBEAR.

## A Strategic Mineral

CHROMITE DEPOSITS OF NEWFOUNDLAND. *By A. K. Snelgrove. Department of Natural Resources, St. John's, Newfoundland. Pp. 26. Price 25c.*

This is a record and an interpretation of results based on field work of the author, who is government geologist of Newfoundland, and other members of the Princeton University Geological Expeditions to Newfoundland. Seven known chromite occurrences are described, and data presented include chemical analyses and a tabulation of magnetic susceptibilities obtained by means of the Frantz isodyne, invented recently by S. G. Frantz.

The composition of some of the chromites, Dr. Snelgrove points out, is such that a high-grade concentrate is possible. In the American market, he adds, these would have to compete with direct-smelting ores from the Eastern Hemisphere. The present availability of Newfoundland chromites is therefore, conditioned by ability to balance favorably concentration costs against the longer transportation of foreign ores.

## Shaft Sinking

LE FONCAGE DES PUITS DE MINE EN TERRAINS AQUIFÈRES. LES PRINCIPAUX PROCÉDÉS SPÉCIAUX. *By M. Biquet. Georges Thone, Liège, Belgium. Pp. 160.*

What method to use for shaft sinking in wet ground is frequently difficult to decide. In this brief monograph the author discusses three methods: the cementation, Honigmann, and freezing. He gives the historic development and the working procedure under various conditions in each case. Cost of sinking is discussed in a general way.

## Statistics

MINERALS YEARBOOK 1934. *United States Bureau of Mines, Department of the Interior. For sale by Superintendent of Documents, Government Printing Office, Washington, D. C. Price $1.75.*

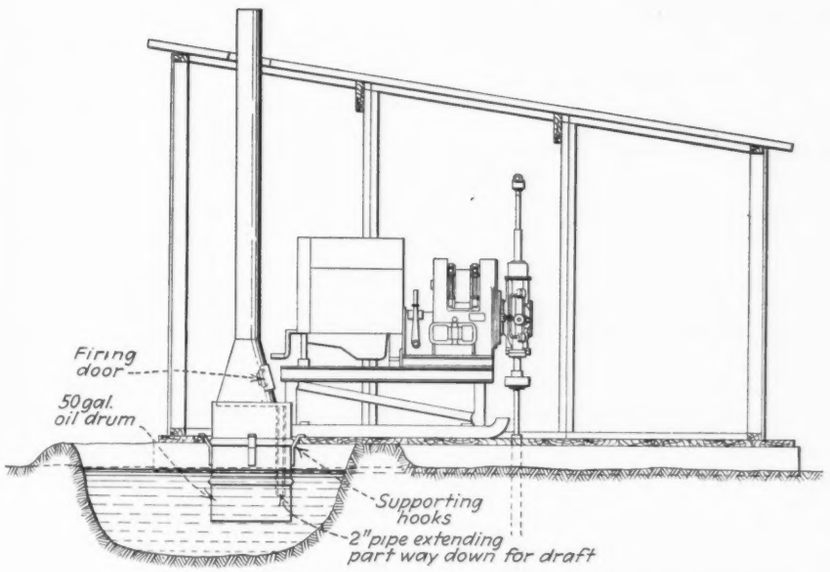
This is the second volume in a new series of yearbooks containing statistical information and economic discussions of mining, superseding "Mineral Resources of the United States." The economic data show that the downward trend in the mineral industry was abruptly halted in 1933. That year was broadly characterized by expanding markets and improved prices, and the general trend of mineral industries was unmistakably upward.

## Dominion Products

CANADIAN TRADE INDEX, 1934. *Canadian Manufacturers' Association, Toronto, Canada. Pp. 842. Price, $6.*

This annual publication is a guide to Canadian manufacturers and their products, listed in separate alphabetical sections. In addition to these two sections there is one devoted to export, giving details of government services, export procedure, selling costs and financing. A fourth section contains a list of Canadian exporters of agricultural produce. The Index is of particular value to firms desiring to market their products in Canada or to locate Canadian sources of supply for raw materials and manufactured goods.

# EQUIPMENT NEWS




**The typical winter arrangement of a gasoline-driven diamond-drill outfit in the field, showing the means employed for heating the circulating water**

## Gas Core Drills Replace Steam Equipment

### Change Found Advantageous in Canadian Prospecting

Progress in diamond-drilling practice continues. One of the more notable changes taking place is the replacement of steam-driven drills by gasoline-powered equipment, the change being particularly striking in Canada, where the long, severe winters had led most mining people to believe that steam power was really essential for efficient winter operation.

The change to gas-operated drills in Canada was in a measure caused by fear of brush fires in the summer, according to Hugh Boyle, agent for Canadian Longyear, Ltd., at North Bay, Ont. The Department of Forestry insisted on the use of gas outfits in certain localities. Once the gas outfits were in use, however, their higher efficiency and lower operating cost commended them for general use in the summer; and it was not long before the drawbacks, both real and imaginary, to their use in the winter were overcome.

Modern gasoline-driven diamond drills have motor and drill compactly mounted on a single sturdy steel frame. The present tendency is to use a separate motor for driving the circulating pump, but both pump and drill are frequently driven from the same motor and mounted on the same frame. The unit may be mounted on a motor truck instead of a steel frame for rapid moves between holes.

The more obvious points in favor of gas operation over steam operation are:

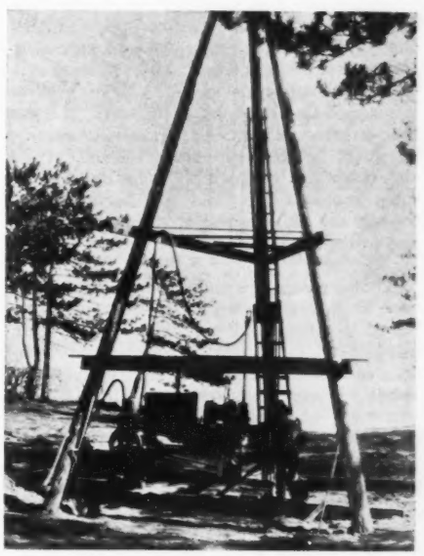
1. Lower fuel cost.
2. Transportation costs for both machinery and fuel are considerably less.
3. The ease and convenience of moving from hole to hole are pronounced. Motor and drill are assembled ready for immediate operation. When moving a steam outfit the boiler must be drained, refilled, and fired, and steam lines have to be connected.
4. Operations can be started immediately at the beginning of a shift without waiting to get up steam.
5. A gas outfit is particularly desirable in rough, hilly, or inaccessible country where wagon transportation is difficult. The diamond drill can be moved on its own power by running the hoisting cable through a sheave or pulley between the skids and attaching the end to a tree or stake ahead of the drill.

For winter operation, circulating water is warmed by means of a stove improvised from an oil barrel lying on its side partly submerged in the sump. The seams of the barrel are welded. A smokestack is attached at one end of the upper side, and a door set in the other end for stoking. The remainder of the sump is covered by brush. The drill shanty partly covers both sump and stove, with the smokestack end of the stove outside of the shanty. The sump stove usually furnishes sufficient heat to warm the shanty. The accompanying drawing shows a typical winter arrangement.

Drill shanties are easily kept warm by means of a small stove, a circulation of the air being maintained by the radiator fan of the motor. The sump stove mentioned in the foregoing usually gives ample heat. No ice accumulates on the floor of the shanty, as it sometimes does when steam power is employed.

Starting large motors in the morning is facilitated if the crankcase is drained the previous night and the oil heated before being replaced in the motor.

On one job in northwestern Quebec last winter, a contractor using a Longyear UG Straitline drill, moved, set up, and completed a hole to a depth of 147 ft. in 27 hours, an impossibility for a steam outfit in that formation. Most diamond-drill men agree that gas diamond drills will soon replace steam drills almost entirely for both winter and summer drilling from the surface.



**A gasoline-driven diamond drill, having motor and drill compactly mounted on a single steel frame**

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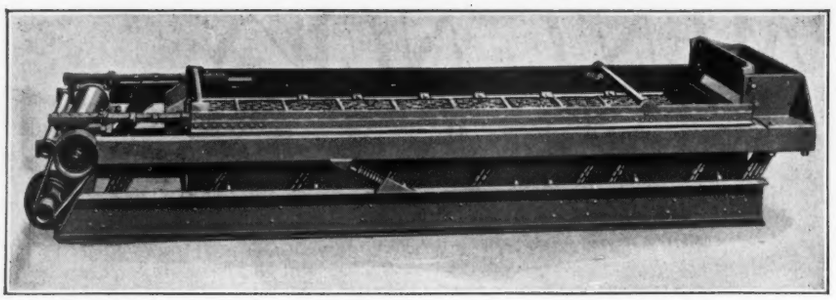
### Capacity-Weight Ratio High in New Crane

Compactness, high efficiency, high capacity, as well as flexibility and mobility, are claimed for a new crane (the CT-50 Loadmaster) developed by Bucyrus-Erie Company, South Milwaukee, Wis. This unit is powered with a Caterpillar 50 gasoline or diesel engine and mounted on modified Caterpillar tracks. It has a 30-ft. boom and swings through 240 deg. It will lift 13,900 lb. at a 12-ft. radius and is able to travel quickly on uneven ground.



# Screen Capacity Increased by Novel Design

### Vibration Principle Employed Permits Level Setting

By using a different principle of vibration and a flat-lying screen, the makers of the new Symons screen, which is shown in a cut, assert they have succeeded in increasing its screening capacity per square foot of cloth in comparison with other types of screens. At the same time, better grading is said to be secured, there being quicker stratification and removal of undersize. The screen has a vibrating action, which is a combination of conveying and screening and permits the screen to be set level. It is of full floating design, all vibrating parts being mounted on flexible supports. To the heavy frame channels are attached two sets of such flexible supports inclined at 30 deg. with the vertical. The lower ends of these supports are fixed; to the upper end of one set is attached the screening deck and to the other set the side bars or balancing deck.

At the discharge end of the screen deck are four flexible supports set in a horizontal position and to which the driving mechanism is attached. The latter consists of a shaft carried on anti-friction bearings, and housed against dust. Two sets of two bearings each are provided on this shaft, the bearings on the eccentric part of the shaft being connected to the screen deck, and the bearings on the concentric extensions of the shaft are for the side bars or balancing deck, these bars being further carried by the flexible supports already mentioned.

As the shaft is revolved, the screen deck is given a movement in a horizontal direction, but because of its being carried on the inclined flexible supports the material on the deck is lifted and actually carried forward a definite distance with each throw of the eccentrics. Given this screening and conveying action, the screen is set level. It does not have to be inclined.

As the screen deck moves in one direction, the reaction is taken by the side bars or balance deck and causes the side bars to move in the opposite direction. For every set of forces acting in one direction, another set acts directly opposite, so that the moving parts are counterbalanced. For this reason the screen can operate satisfactorily with long throw and at high rates of speed.

The feed hopper is mounted on the side bars and vibrates with them, thereby providing an automatic and uniform feeding arrangement. The drive unit is at the discharge end out of the path of falling material. For hot or dusty screening this has an advantage, in that the operating mechanism and motor can be outside of the housing and away from the dust and heat.

The screen cloth is set in panels, readily removable. It is not stretched, this coupled with the fact that it is well supported insuring its long life. These screens are made by Nordberg Manufacturing Company, Milwaukee, Wis., with one, two, or three decks and in any length up to 20 ft.

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### For Blast-Hole Drilling

A new spudder line made of mild plow steel, for use in water-well and blast-hole drilling, has been announced by the Macwhyte Company, Kenosha, Wis. It has three times the stretch of standard drilling line and has been used successfully in wells running between 500 and 1,000 ft. deep. It is known as Hi-Lastic.

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### Accounting While Weighing

A degree of precision which makes the recording of weights as accurate as actual weighing, eliminating every possible human error of reading weight, remembering and recording it, has been developed in the so-called Printweigh by the Toledo Scale Company. The mechanism, which is not complicated, is electrically operated and may be used with any automatic dial scale made by the company, including those now in use. It may likewise be had in any weight capacity from 50 to 50,000 lb. The manufacturer's conviction that scales should be regarded as accounting machines used to obtain basic accounting facts, is said to be expressed in the new scale.

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### For Small Crushing Plants

A new gyratory, in one size only, having a 20-in. diameter head and a nominal feed opening of 3 in., which may be varied slightly, has been designed by Traylor Engineering & Manufacturing Company, Allentown, Pa. It is styled the Type TY reduction crusher and is introduced as a "little brother" of the company's Type TZ machine. The discharge may be varied by ½ in. to 1 in., on the closed side. Capacity ranges from about 6 tons to ½ in. to about 29 tons to 1 in. The crusher weighs about 9,000 lb. and takes 10 to 25 hp., according to the rock.

### New Magnetic Separator Uses Alternating Current

A new magnetic separator, capable of concentrating highly magnetic substances, with the use of alternating current instead of the conventional direct current invariably necessary for energizing magnetic equipment, has been introduced by Magnetic Manufacturing Company, Milwaukee, Wis. Where fine, powdered material is encountered, having a high magnetic content in considerable quantity to be eliminated or recovered, the new Type AM machine may be found adaptable. Any standard a.c. voltage would be satisfactory for energizing it. The principle of operation consists in feeding the material to a suspended magnet located within a belt conveyor. As the mixed material is delivered to the field, the magnetic substances are lifted and carried in suspension while passing through it, and finally automatically discharged when the belt conveyor reaches the head pulley and leaves the magnetic influence. The particular feature of the operation is the thorough cleansing of the magnetic from the non-magnetic material while in the magnetic field, the alternating current providing high agitation or pulsation, at the rate of 120 cycles per second on 60-cycle current.

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### Kraut Flotation Machine In New, Smaller Size

Specifications suggested by the current trend in gold mining were followed by the Pan-American Engineering Corporation, 820 Parker St., Berkeley, Calif., in constructing what may be termed a "pocket edition" of the standard Kraut flotation machine. In the last three years many large plants built prior to 1929 for beneficiating low-grade base-metal ores have been closed or dismantled. Revival of interest in gold mining created a demand for small, efficient, flexible plants.

This machine is built according to specifications set up by the pilot mill or the small 50- to 100-ton plant (or smaller). It is a replica of the standard Kraut in design, construction, and materials, differing only in dimensions, capacity, and price, which are exactly one-half of what they would be in the case of the standard machine. Metallurgical capacity is 10 to 20 tons per cell per day. Large aeration capacity combined with intense agitation, effective circulation of pulp, and low power and reagent consumption in rela-

**This Kraut machine will handle 10 to 20 tons per cell per day**

tion to tonnage treated are said to characterize the small unit. The vacuum method distinctive of the Kraut machine is said to permit perfect control of the froth. Design is simple.

## Exceptional Mobility Claimed for New Wagon Drill

For surface drilling where a light mobile rig is required, the Worthington Pump & Machinery Corporation, Harrison, N. J., has introduced its new Rock Master, mounted on a light carriage. The rig is said to be easily adaptable for down-hole drilling, line drilling and hillside drilling as well as for drilling breast holes, side holes and snake holes. Drill and carriage can be taken to any job where a hand drill can be used. According to the maker, the drill has been employed extensively for deep hole work up to 20 ft., supplemented by hand-held drills for block shooting. Several different drifters, in either wet or dry type, can be used with the rig.

## Gas-driven Turbine Proves A Money Saver

Athletic Mining & Smelting Company, at Fort Smith, Ark., has a 45-hp. turbine manufactured by the Elliott Company, Pittsburgh, Pa., which is expected to return its first cost within six months through savings. It runs on natural gas at 40-50-lb. gage pressure and drives a centrifugal water pump which supplies the plant. The turbine exhaust enters the low-pressure gas main at about 8-lb. gage. The gas now passing through the turbine represents about two-thirds of that needed for operating the entire plant. If the plant were running at full load, the gas would be about 45 per cent of the total.

## Alternating Current Equipment For Arc Welding

In addition to its direct-current arc-welding equipment, General Electric now has a complete line of alternating-current arc-welding equipment, including transformer units, electrodes, and automatic welding heads and control. This is intended for heavy-current welding. The new transformer units come in three sizes, having one-hour ratings of 500, 750, and 1,000 amp. Primaries are wound for 220, 440, or 550 volts, 60, 50 or 25 cycles, single phase.

## Eye Protection Against Welding And Chipping

Attention of shop men or anyone engaged in chipping and welding work is sought by Willson Products, Inc., of Reading, Pa., for a new safety goggle affording protection against impact and flying chips and against dangerous light rays and glare. This goggle (Style DC50) has two sets of lenses, one the company's Super-Tough lenses and the other its Wilson Weld lenses, the latter being so hinged as to permit their being raised at right angles to the others when welding is not in progress.

## Silver for Chemical Equipment

As part of a survey of existing and potential uses of silver, made under a research associateship established at the National Bureau of Standards by a group of American silver producers, a study has been made of the field of silver in chemical manufacturing equipment. An item in Technical News Bulletin No. 210 (October, 1934) covered its resistance to corrosion by various agents. The methods of fabricating silver equipment are being studied, as well as the properties of silver which are of special interest in this connection. Silver has a higher electrical and thermal conductivity than any other metal. Its softness and ductility are well known. Equipment which requires its use may either be made entirely of fine silver or it may be lined with the metal. Fine silver equipment is the simplest to construct and is much used.

## Improving the Shovel

In a shovel newly designed by Wood Shovel & Tool Company of Piqua, Ohio, the familiar hollow in the back of the blade is done away with and in its place a steel plate is welded securely to the blade, extending up into the socket. The upper part of this plate, however, is free to permit flexing, so that, there being no strain on the insert, it cannot pull loose. Thus, the one-piece steel blade is made smooth front and back, although permitting the use of a tapered socket, which, it is said, is heat-treated to provide greater strength and springiness than a heavy solid shank offers.

## Multiple-rope Sheaves in Steel

A steel sheave having its outside walls reinforced by a convex steel plate has been introduced under the name of Duro-Brace Texsteel sheave by the Allis-Chalmers Company, Milwaukee, Wis. This reinforcing is intended to overcome the defect sometimes met in using sheaves whereby their outside walls bend under excessive overloads, throwing them off true. The steel plate is said to strengthen the vulnerable areas, eliminating the possibility of distortion.

## Locknut Foolproof

An automatic locknut fitting any standard thread and said to be simple in design and highly efficient is offered by the Automatic Nut Company, Inc., Chrysler Building, New York. Built integrally with the nut is a locking pin of chrome-vanadium rustless steel with a high percentage of nickel. When the nut is applied, this pin is engaged by the bolt thread, following it down until the nut is seated. The pin engages the thread at a slight angle, establishing a perpetual lock proof against vibration and shock. To remove the nut, it is turned in the opposite direction, throwing the pin over in the other direction, after which it follows the threads off the bolt. The nut, according to the company, is absolutely foolproof and can be put on and taken off over and over, the same as any ordinary nut, without impairing the bolt threads.

## Industrial Notes

International Nickel Company has added Fred J. Walls to its development and research staff. He will concentrate on the use in industry of nickel cast irons.

Worthington Pump & Machinery Corporation, Harrison, N. J., has established Pacific Coast regional headquarters at 510 W. 6th St., Los Angeles. C. W. Wilson, vice-president, will be in charge.

Rockwell O. Egeland, founder and manager of Mine & Smelter Equipment Company, Phoenix, Ariz., has returned to active duty after more than a year's absence due to illness. W. C. Jewell has been appointed office manager.

Canadian Sullivan Machinery Company, Ltd., has superseded the Sullivan Machinery Company, Ltd., and has concluded arrangements with John Bertram & Sons, Ltd., who will manufacture Canadian Sullivan products in their plant at Dundas, Ont.

## Bulletins

**Safety Equipment.** Portable Lamp & Equipment Co., Pittsburgh, Pa. Catalog No. 34. Pp. 50.

**Welding, Cutting.** Linde Air Products Co., New York. Bulletin on safe practices in storage, care and handling of oxyacetylene welding and cutting equipment. Pp. 24.

**Semi-portable Air Compressors.** Fuller Company, Catasauqua, Pa. Bulletin C-3A. Pp. 16.

**Polarizing Microscopes.** Bausch & Lomb Optical Co., Rochester, N. Y. Pp. 26.

**Prospecting Core Drill.** Sullivan Machinery Co., Chicago. Bulletin 85-X. No. 6 one-man drill. Pp. 8.

**Switchgear.** Roller-Smith Co., New York. Catalog No. 8. Pp. 24.

**Welding Electrodes and Accessories.** General Electric Co., Schenectady, N. Y. Bulletin GEA-1546 B. Pp. 16.

**Seal-Clad Motor.** Allis-Chalmers Manufacturing Co., Milwaukee, Wis. Leaflet 2182. Pp. 4.

**Centrifugal Pumps.** Worthington Pump & Machinery Corp., Harrison, N. J. Type L single-stage volute pump. Pp. 4.

**Assaying and Laboratory Equipment.** Denver Fire Clay Co., Denver, Colo. General catalog No. 12.

**Widia Cemented Carbides.** Thomas Prosser & Son, New York. For tools and wear-resisting parts. Pp. 24.

**Alkalinity Testing.** Pfaltz & Bauer, Inc., New York. Leaflet on pH testing by the indicator strip method.

**Wire and Cable Insulation.** Simplex Wire & Cable Co., Boston, Mass. Bulletin, Anhydrex rubber insulation. Pp. 16.

**Boron Carbide Abrasives.** Norton Co., Worcester, Mass. Bulletin on Norbide. Pp. 12.

**Noise and Vibration Control.** Cork Insulation Co., New York. Corinco isolation corkboard. Pp. 2.

**Drilling and Fishing Tools.** Bucyrus-Erie Co., South Milwaukee, Wis. Catalog 983. Pp. 48.

**Turbines for Mechanical Drive.** General Electric Co., Schenectady, N. Y. Types D-58, D-60, and DS-60.

**Metal-enclosed Switchgear.** General Electric Co., Schenectady, N. Y. Bulletin GEK 86. Pp. 4.

**Pott Pneumatic Impact Wrench.** Ingersoll-Rand Co., New York. Pp. 6.

**Excavators, Related Equipment.** Bucyrus-Erie Co., South Milwaukee, Wis. Bulletin PC5. Pp. 64.

**Portable Compressors, Two-stage Air-cooled.** Chicago-Pneumatic Tool Co., New York. Bulletin 758. Pp. 20.

**Electric Mine Haulage.** Ohio Brass Co., Mansfield, Ohio. Catalog No. 21. Supplies and accessories for trolley lines, locomotives, rail bonds, etc.; mine safety and control devices. Pp. 422.

# SUMMARY OF

## MONTHLY COMMENT . . . DAILY AND AVERAGE MONTHLY

MAJOR non-ferrous metals, taken as a group, sold in about the same volume during December as in the preceding month. Copper transactions in the domestic market involved 19,500 tons, against 15,300 tons in November. The tonnage of zinc sold was about the same for both months, whereas lead sales fell off moderately. Activity in tin increased, buyers being forced to take hold because of diminishing reserves. Silver was purchased in the open market by speculators in sufficient volume to offset a slackening in operations by the Treasury.

As for prices, the trend during December was slightly upward. Our weighted index of non-ferrous metal prices for December was 71.13, the high for the year, and compares with 71.07 in November, and 67.84 in December, 1933. The index for 1934 was 69.56, against 59.79 for 1933 and 48.26 for 1932. The rise in the yearly index resulted chiefly from higher average prices for domestic copper, silver, and tin, all three of which have come under artificial price control.

Domestic copper closed the year at 9c., Valley, against 8¼c. at the beginning of 1934. Foreign copper steadied in December on the possibility of an agreement to control output in 1935. A definite date for the international gathering of copper producers has not yet been announced, but action is expected soon. The price chart, issued as a supplement to this issue of *E.&M.J.*, indicates clearly just what has happened to foreign and domestic prices for copper. According to those in close touch with the situation, one of the objectives of the industry for 1935 is to bring the two markets more in line, if not virtually on the same plane.

Domestic lead prices were raised 20 points during December, making the final quotation for the year 3.70c., New York, against 4.15c. on the last business day of December, 1933. Producers regarded the outlook as more favorable, and selling pressure was less evident. Consumers are believed to be underbought. Buyers defend their conservative purchasing policy by pointing to the statistical position of lead. Stocks of refined lead in the United States at the end of November totaled 232,509 tons, against 229,859 tons a month previous.

Zinc sold in fair volume, galvanizers showing more interest on expectations of a broader outlet for galvanized products this year.

Effective Jan. 2, 1935, refined platinum was reduced $1 per ounce to the basis of $34. Offerings of antimony by Chinese interests have been light, which caused prices to remain firm.

### United States Market

| | Electrolytic Copper | | | Straits Tin | Lead | | Zinc |
|---|---|---|---|---|---|---|---|
| | Domestic | | Export | New York | New York | St. Louis | St. Louis |
| Dec. | (a) | (b) | (c) | | | | |
| 1 | 9.00 | 8.775 | 6.500 | 51.150 | 3.500 | 3.350 | 3.7000 |
| 3 | 9.00 | 8.775 | 6.425 | 50.950 | 3.500 | 3.350 | 3.7000 |
| 4 | 9.00 | 8.775 | 6.400 | 50.875 | 3.500 | 3.350 | 3.7000 |
| 5 | 9.00 | 8.775 | 6.425 | 50.925 | 3.500 | 3.350 | 3.7000 |
| 6 | 9.00 | 8.775 | 6.525 | 51.050 | 3.500 | 3.350 | 3.7000 |
| 7 | 9.00 | 8.775 | 6.550 | 50.950 | 3.500 | 3.350 | 3.7000 |
| 8 | 9.00 | 8.775 | 6.600 | 50.950 | 3.500 | 3.350 | 3.7000 |
| 10 | 9.00 | 8.775 | 6.625 | 51.050 | 3.500 | 3.350 | 3.7000 |
| 11 | 9.00 | 8.775 | 6.575 | 51.000 | 3.500 | 3.350 | 3.7000 |
| 12 | 9.00 | 8.775 | 6.575 | 50.950 | 3.500 | 3.350 | 3.7000 |
| 13 | 9.00 | 8.775 | 6.600 | 50.875 | 3.500 | 3.350 | 3.7000 |
| 14 | 9.00 | 8.775 | 6.650 | 50.950 | 3.600 | 3.450 | 3.7000 |
| 15 | 9.00 | 8.775 | 6.675 | 51.000 | 3.600 | 3.450 | 3.7000 |
| 17 | 9.00 | 8.775 | 6.700 | 50.850 | 3.700 | 3.550 | 3.7175 |
| 18 | 9.00 | 8.775 | 6.700 | 50.900 | 3.700 | 3.550 | 3.7250 |
| 19 | 9.00 | 8.775 | 6.700 | 50.875 | 3.700 | 3.550 | 3.7250 |
| 20 | 9.00 | 8.775 | 6.650 | 50.800 | 3.700 | 3.550 | 3.7250 |
| 21 | 9.00 | 8.775 | 6.700 | 50.850 | 3.700 | 3.550 | 3.7250 |
| 22 | 9.00 | 8.775 | 6.700 | 50.850 | 3.700 | 3.550 | 3.7250 |
| 24 | 9.00 | 8.775 | 6.700 | 50.850 | 3.700 | 3.550 | 3.7250 |
| 25 | Holiday | | | | | | |
| 26 | 9.00 | 8.775 | 6.700 | 50.850 | 3.700 | 3.550 | 3.7250 |
| 27 | 9.00 | 8.775 | 6.700 | 50.800 | 3.700 | 3.550 | 3.700@3.725 |
| 28 | 9.00 | 8.775 | 6.700 | 50.725 | 3.700 | 3.550 | 3.7250 |
| 29 | 9.00 | 8.775 | 6.700 | 50.725 | 3.700 | 3.550 | 3.7250 |
| 31 | 9.00 | 8.775 | 6.700 | 50.800 | 3.700 | 3.550 | 3.7250 |
| Av. for month | | 8.775 | 6.619 | 50.902 | 3.604 | 3.454 | 3.711 |
| **Averages for Week** | | | | | | | |
| 5 | | 8.775 | 6.454 | 51.030 | 3.500 | 3.350 | 3.700 |
| 12 | | 8.775 | 6.575 | 50.992 | 3.500 | 3.350 | 3.700 |
| 19 | | 8.775 | 6.671 | 50.908 | 3.633 | 3.483 | 3.711 |
| 26 | | 8.775 | 6.690 | 50.840 | 3.700 | 3.550 | 3.725 |
| **Calendar Week Averages** | | | | | | | |
| 1 | | 8.775 | 6.508 | 51.260 | 3.500 | 3.350 | 3.695 |
| 8 | | 8.775 | 6.488 | 50.950 | 3.500 | 3.350 | 3.700 |
| 15 | | 8.775 | 6.617 | 50.971 | 3.533 | 3.383 | 3.700 |
| 22 | | 8.775 | 6.692 | 50.854 | 3.700 | 3.550 | 3.724 |
| 29 | | 8.775 | 6.700 | 50.790 | 3.700 | 3.550 | 3.723 |

### Silver, Gold, and Sterling Exchange New York and London

| | Sterling Exchange | | Silver | | Gold | |
|---|---|---|---|---|---|---|
| | | "90-day | (d) | | | (e) United |
| Dec. | "Checks" | Demand" | New York | London | London | States |
| 1 | 4.97250 | 4.97625 | 55.000 | 24.6250 | 139s 9½d | $35.00 |
| 3 | 4.95625 | 4.95875 | 54.875 | 24.6875 | 140s 2 d | 35.00 |
| 4 | 4.94750 | 4.95000 | 54.875 | 24.6875 | 140s 6½d | 35.00 |
| 5 | 4.94250 | 4.94500 | 54.875 | 24.7500 | 140s 11 d | 35.00 |
| 6 | 4.95500 | 4.95750 | 55.000 | 24.8750 | 140s 7 d | 35.00 |
| 7 | 4.95000 | 4.95250 | 54.750 | 24.6875 | 140s 3½d | 35.00 |
| 8 | 4.94500 | 4.94625 | 54.750 | 24.6250 | 140s 8 d | 35.00 |
| 10 | 4.95125 | 4.95375 | 54.750 | 24.5000 | 140s 4½d | 35.00 |
| 11 | 4.95125 | 4.95250 | 54.875 | 24.6250 | 140s 4½d | 35.00 |
| 12 | 4.94625 | 4.94875 | 54.750 | 24.5625 | 140s 5 d | 35.00 |
| 13 | 4.94000 | 4.94125 | 54.625 | 24.4375 | 140s 8½d | 35.00 |
| 14 | 4.94375 | 4.94500 | 54.625 | 24.4375 | 140s 9 d | 35.00 |
| 15 | 4.94875 | 4.95000 | 54.625 | 24.4375 | 140s 5½d | 35.00 |
| 17 | 4.94000 | 4.94000 | 54.250 | 24.2500 | 140s 7 d | 35.00 |
| 18 | 4.94375 | 4.94500 | 53.750 | 23.9375 | 140s 9 d | 35.00 |
| 19 | 4.94250 | 4.94250 | 53.875 | 24.0625 | 140s 9½d | 35.00 |
| 20 | 4.94000 | 4.94000 | 54.125 | 24.1875 | 140s 8½d | 35.00 |
| 21 | 4.93750 | 4.93750 | 53.250 | 23.8125 | 140s 11 d | 35.00 |
| 22 | 4.94375 | 4.94375 | 53.375 | 23.8750 | 140s 8½d | 35.00 |
| 24 | 4.94125 | 4.94125 | 53.500 | 23.9375 | 140s 8 d | 35.00 |
| 25 | Holiday | | | | | |
| 26 | 4.94250 | 4.94250 | 53.500 | Holiday | | 35.00 |
| 27 | 4.93750 | 4.93750 | 53.875 | 24.1250 | 140s 10½d | 35.00 |
| 28 | 4.93375 | 4.93375 | 54.375 | 24.3750 | 140s 10½d | 35.00 |
| 29 | 4.93750 | 4.93875 | 54.750 | 24.5625 | 140s 11½d | 35.00 |
| 31 | 4.94000 | 4.94125 | 54.750 | 24.6250 | 141s | 35.00 |
| Av. for month | 4.94520 | ..... | 54.390 | 24.404 | ..... | 35.00 |
| **Averages for Week** | | | | | | |
| 5 | 4.95925 | ..... | 54.925 | ..... | ..... | ..... |
| 12 | 4.94979 | ..... | 54.813 | ..... | ..... | ..... |
| 19 | 4.94313 | ..... | 54.292 | ..... | ..... | ..... |
| 26 | 4.94100 | ..... | 53.550 | ..... | ..... | ..... |

Calendar week averages: New York Silver Dec. 1st, 55.05; 8th, 54.854; 15th, 54.708; 22nd, 53.771; 29th, 54.000.

*(a)* Quotation issued by the Code Authority for copper offered for sale in the domestic market pursuant to the provisions of the Copper Code.

*(b)* Net prices at refineries on the Atlantic seaboard, being Code Authority prices, less delivery and interest charges of 0.225c. per lb. which is the average differential for delivery in New England.

*(c)* Export quotations for copper are net prices at refineries on the Atlantic seaboard and include sales of domestic copper in the foreign market. The c.i.f. Hamburg, Havre, and Liverpool basis commands a premium of 0.300c. per lb. above our f.o.b. refinery quotation.

Excepting "Blue Eagle" copper, the above quotations are our appraisal of the major United States markets, based on sales reported by producers and agencies. All prices are in cents per pound.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingot bars; cathodes discount of 0.125c.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York is quoted at 0.35c. per pound above St. Louis, this being the freight differential. Contract prices for High-Grade zinc delivered in the East and Middle West in nearly all instances command a premium of 1c. per pound over the current market for Prime Western but not less than the *E. & M. J.* average for Prime Western for the previous month.

Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

*(d)* Silver other than newly mined domestic. Under Executive order issued Dec. 21, 1933, the U. S. Government price on newly mined domestic silver was established at 64½c. per troy ounce.

*(e)* U. S. Treasury's gold price.

# THE MARKETS

## PRICES OF METALS . . . MISCELLANEOUS QUOTATIONS

### London Market

| Dec. | Copper: Standard Spot | Copper: Standard 3M | Copper: Electrolytic Bid | Tin: Spot | Tin: 3M | Lead: Spot | Lead: 3M | Zinc: Spot | Zinc: 3M |
|---|---|---|---|---|---|---|---|---|---|
| 3 | 26.8125 | 27.1250 | 30.0000 | 228.3750 | 228.8750 | 10.3750 | 10.6875 | 11.9375 | 12.1875 |
| 4 | 26.8750 | 27.1875 | 30.0000 | 228.3750 | 228.8750 | 10.3750 | 10.6250 | 11.9375 | 12.1875 |
| 5 | 27.1875 | 27.5625 | 30.5000 | 228.3750 | 228.7500 | 10.3125 | 10.5625 | 11.8125 | 12.1250 |
| 6 | 27.5000 | 27.8750 | 30.5000 | 227.7500 | 228.7500 | 10.3125 | 10.5625 | 11.8125 | 12.1875 |
| 7 | 27.8125 | 28.1875 | 31.0000 | 228.2500 | 228.8750 | 10.3750 | 10.6250 | 11.8125 | 12.1250 |
| 10 | 27.7500 | 28.1250 | 31.0000 | 228.5000 | 228.6250 | 10.3125 | 10.5625 | 11.7500 | 12.0000 |
| 11 | 27.7500 | 28.1250 | 31.0000 | 228.2500 | 228.5000 | 10.1250 | 10.4375 | 11.6875 | 11.8750 |
| 12 | 27.6875 | 28.0625 | 31.0000 | 228.5000 | 228.5000 | 10.1250 | 10.4375 | 11.6875 | 11.8750 |
| 13 | 27.8750 | 28.3125 | 31.0000 | 228.5000 | 228.5000 | 10.2500 | 10.5625 | 11.6875 | 11.9375 |
| 14 | 28.0625 | 28.4375 | 31.2500 | 228.2500 | 228.5000 | 10.2500 | 10.5000 | 11.6250 | 11.8750 |
| 17 | 28.3125 | 28.7500 | 31.5000 | 228.2500 | 228.5000 | 10.2500 | 10.5000 | 11.6875 | 11.9375 |
| 18 | 28.1250 | 28.5625 | 31.5000 | 228.0000 | 228.5000 | 10.1250 | 10.4375 | 11.5625 | 11.8125 |
| 19 | 28.0625 | 28.5000 | 31.5000 | 228.1250 | 228.5000 | 10.2500 | 10.5000 | 11.6250 | 11.9375 |
| 20 | 27.8750 | 28.3125 | 31.2500 | 227.7500 | 228.2500 | 10.2500 | 10.4375 | 11.6250 | 11.9375 |
| 21 | 28.3125 | 28.7500 | 31.5000 | 227.6250 | 228.2500 | 10.4375 | 10.4375 | 11.6875 | 12.0625 |
| 24 | 28.3750 | 28.8125 | 31.5000 | 227.8750 | 228.2500 | 10.3750 | 10.5000 | 11.6875 | 12.0625 |
| 25 | | | | | Holiday | | | | |
| 26 | | | | | Holiday | | | | |
| 27 | 28.1875 | 28.6250 | 31.6250 | 228.1250 | 228.2500 | 10.4375 | 10.3125 | 11.6250 | 12.0000 |
| 28 | 28.0625 | 28.5000 | 31.5000 | 228.1250 | 228.2500 | 10.3750 | 10.3750 | 11.7500 | 12.0625 |
| 31 | 28.2500 | 28.6875 | 31.5000 | 228.3750 | 228.2500 | 10.6875 | 10.4375 | 11.8750 | 12.1250 |
| Av. for month | 27.836 | ..... | 31.086 | 228.178 | ..... | 10.316 | 10.500 | 11.730 | 12.016 |

## Current Prices—Miscellaneous Metals, Ores, and Non-Metallic Minerals

Quotations cover wholesale lots, prompt shipment, f.o.b. New York, unless otherwise stated.

**(Jan. 2, 1935)**

### Miscellaneous Metals

| | |
|---|---|
| **Aluminum,** ingot, 99 per cent plus, lb | 23.30c. |
| **Antimony,** domestic and Chinese (duty paid), lb | 13¼c. |
| **Bismuth,** ton lots, lb | $1.10 |
| **Cadmium,** lb | 55.00c. |
| **Chromium,** 97 per cent grade, lb | 88.00c |
| **Nickel,** electrolytic cathodes, lb | 35.00c. |
| **Magnesium,** 99.8 per cent, carloads, lb | 30.00c |
| **Palladium,** troy oz | $24.00 |
| **Platinum,** (official quotation) troy oz | $34.00 |
| **Quicksilver,** flask of 76 lb | $72.50@$73.50 |
| **Radium,** mg. radium content | $50.00 |
| **Selenium,** 99.5 per cent, lb | $2.00 |
| **Silicon,** minimum 97 per cent, spot, lb | 16.50c. |
| **Tellurium,** lb | $2.00 |
| **Thallium,** 100 lb. or more, lb | $6.50 |
| **Titanium,** 96 to 98 per cent, lb | $6.00 |
| **Zirconium,** commercially pure, lb | $7.00 |

### Metallic Ores

| | |
|---|---|
| **Beryllium Ore,** f.o.b. mines, ton | $30.00@$35.00 |
| **Chrome Ore,** 45@47 per cent, c.i.f., long ton | $16.00@$16.50 |
| **Iron Ore,** Lake Superior, long ton: | |
| Old Range bessemer | $4.80 |
| Mesabi, bessemer | $4.65 |
| Old Range, non-bessemer | $4.65 |
| Mesabi, non-bessemer | $4.50 |
| **Lead** (Galena) 80 per cent, Joplin, Mo., ton | $36.00 |
| **Manganese Ore,** long ton unit: | |
| 52@55 per cent | 26c. |
| 49@51 per cent | 25c. |
| 44@47 per cent | 24c. |
| **Molybdenum Ore,** per lb. of contained $MoS_2$ | 42c. |
| **Tungsten Ore,** per unit of $WO_3$: | |
| Chinese duty paid | $17.00 |
| Domestic Scheelite | $16.50 |
| **Vanadium Ore,** per lb. of contained $V_2O_5$ | 26c. |
| **Zinc Ore,** Prime, 60 per cent concentrate, Joplin, Mo.; per ton | $26.00 |

### Metallic Compounds

| | |
|---|---|
| **Arsenious Oxide** (arsenic) lb | 3¼c. |
| **Cobalt Oxide,** 70@71 per cent, lb | $1.35 |
| **Copper Sulphate,** 100 lb | $3.85 |
| **Sodium Nitrate,** ex vessel, in 200-lb. bags, per 100 lb | $1.24 |
| **Sodium Sulphate,** bulk ton | $13.00@$15.00 |

### Alloys

| | |
|---|---|
| **Beryllium-Copper,** Master alloy, 3.5 per cent Be, per lb. of contained Be | $25.00 |
| **Ferrochrome,** 65@70 per cent chromium, 4@6 per cent carbon, lb | 10c. |
| **Ferromanganese,** 78@82 per cent, gross ton | $85.00 |
| **Ferromolybdenum,** 50@60 per cent Mo, lb. of Mo contained | 95c |
| **Ferrosilicon,** 50 per cent, gross ton | $77.50 |
| **Ferrotungsten,** 75@80 per cent, lb. of W contained | $1.35@$1.45 |

### Non-Metallic Minerals

| | |
|---|---|
| **Asbestos,** f.o.b. mines, ton: | |
| Canadian (Quebec) | |
| Crude No. 1 | $450@..... |
| Crude No. 2 | $200@$225 |
| Spinning fibers | $90@$135 |
| Paper stock | $32@ $37 |
| Shorts | $11@ $15 |
| Vermont | |
| Shingle stock | $45@..... |
| Paper stock | $35@..... |
| Cement stock | $23@..... |
| **Barytes,** long ton: | |
| Georgia, crude | $7@..... |
| Missouri, 95 per cent $BaSO_4$, 1 per cent iron | $5@..... |
| **Bauxite,** long ton: | |
| Domestic, chemical, 55@58 per cent | $6@ $7.50 |
| Domestic, abrasive, 78@84 per cent | $12.50@$15.00 |
| Dalmatian, 50@55 per cent | (a)$4.50@ $6.00 |
| French, 56@59 per cent | (a)$5.50@ $6.50 |
| **China Clay,** f.o.b. mines, ton: | |
| South Carolina and Georgia, bulk | $6.00@ $7.50 |
| Delaware, No. 1 | $14.00@..... |
| **Feldspar,** bulk, ton: | |
| Potash feldspar, 200 mesh | $17.00 |
| Glass-spar, white, 20 mesh | $11.50 |
| **Fluorspar,** f.o.b. mines, bulk, Kentucky and Illinois 85-5 per cent, all rail movement, ton | @$16.00 |
| **Fuller's earth,** f.o.b. Georgia or Florida, ton | $7.00@$14.00 |
| **Magnesite,** per ton: | |
| Dead-burned, f.o.b. California | $25.00@..... |
| Dead-burned, f.o.b. Washington | $22.00@..... |
| **Mica,** per lb., North Carolina, No. 1 and 2 quality: | |
| 1½x2in. | 15@30c. |
| 2x2in. | 30@50c. |
| 2x3in. | 50@65c. |
| 3x4in. | 90@ $1.25 |
| 4x6in. | $1.50@ $2.50 |
| White, ground, 70 mesh, ton | $60.00@$80.00 |
| **Ocher,** Georgia, ton | $19.00@$22.50 |
| **Pyrites,** Spanish, per long ton unit of S, c.i.f. Atlantic ports | (a) 12@ 12½c |
| **Silica,** water-floated, in bags, 325 mesh, ton | $16.00@$40.00 |
| **Sulphur,** Texas mines, long ton | $18.00@..... |
| **Talc,** f.o.b. works, ton: | |
| New York, double air-floated, 325 mesh | $12.00@$15.00 |
| New Jersey, mineral pulp | $8.00@$10.00 |
| Vermont, extra white, 200 mesh | $8.50@ $9.00 |
| **Tripoli,** Missouri, ton: | |
| 40 mesh, cream colored | $16.00@..... |
| 200 mesh, cream colored | $26.00@..... |

(a) Nominal.

### Iron and Steel

| | |
|---|---|
| **Pig Iron,** Valley furnaces, gross ton: | |
| Bessemer | $19.00 |
| Basic | $18.00 |
| No. 2 Foundry | $18.50 |
| **Steel,** base prices, Pittsburgh: | |
| Billets, gross ton | $27.00 |
| Structural shapes, 100 lb | $1.80 |
| Bars, 100 lb | $1.80 |

# MONTHLY AND YEARLY AVERAGE PRICES

## Silver and Sterling Exchange

| | New York | | London Spot | | Sterling Exchange | |
|---|---|---|---|---|---|---|
| | 1933 | 1934 | 1933 | 1934 | 1933 | 1934 |
| January | 25.400 | 44.188 | 16.883 | 19.382 | 336.060 | 504.644 |
| February | 26.074 | 45.233 | 16.885 | 20.073 | 342.114 | 503.085 |
| March | 27.928 | 45.875 | 17.588 | 20.278 | 343.138 | 509.259 |
| April | 30.730 | 45.180 | 18.440 | 19.740 | 357.565 | 515.210 |
| May | 34.072 | 44.226 | 19.046 | 19.276 | 393.106 | 510.510 |
| June | 35.663 | 45.173 | 19.078 | 19.981 | 413.216 | 504.721 |
| July | 37.630 | 46.310 | 18.341 | 20.512 | 464.760 | 503.990 |
| August | 36.074 | 48.986 | 17.877 | 21.377 | 449.944 | 506.398 |
| September | 38.440 | 49.484 | 18.272 | 21.888 | 466.240 | 499.344 |
| October | 38.190 | 52.375 | 18.221 | 23.581 | 466.380 | 494.019 |
| November | 42.974 | 54.255 | 18.428 | 24.257 | 514.573 | 498.832 |
| December | 43.550 | 54.390 | 18.674 | 24.404 | 511.260 | 494.520 |
| Year | 34.727 | 47.973 | 18.144 | 21.229 | 421.530 | 503.711 |

New York quotations for silver not eligible for sale to U. S. Government, cents per ounce troy, 999 fine. London, pence per ounce, sterling silver, 925 fine. Sterling exchange in cents.

## Copper

| | F.O.B. Refinery | | | London Spot | | | |
|---|---|---|---|---|---|---|---|
| | Electrolytic | | | Standard | | (a) Electrolytic | |
| | Domestic | | Export | | | | |
| | 1933 | 1934 | 1934 | 1933 | 1934 | 1933 | 1934 |
| January | 4.775 | 7.890 | 7.831 | 28.557 | 32.560 | 33.244 | 35.614 |
| February | 4.775 | 7.777 | 7.844 | 28.481 | 33.072 | 32.556 | 35.969 |
| March | 5.011 | 7.775 | 7.837 | 28.179 | 32.497 | 32.370 | 35.512 |
| April | 5.395 | 8.173 | 8.053 | 29.576 | 33.006 | 33.681 | 36.038 |
| May | 6.698 | 8.275 | 7.913 | 34.071 | 32.662 | 38.163 | 35.756 |
| June | 7.773 | 8.594 | 7.705 | 36.759 | 32.149 | 41.000 | 35.339 |
| July | 8.635 | 8.775 | 7.146 | 37.917 | 29.707 | 41.524 | 32.778 |
| August | 8.768 | 8.775 | 6.885 | 36.071 | 28.358 | 40.227 | 31.483 |
| September | 8.753 | 8.775 | 6.586 | 35.122 | 27.541 | 38.339 | 30.556 |
| October | 7.950 | 8.775 | 6.315 | 33.656 | 26.753 | 36.977 | 29.478 |
| November | 7.881 | 8.775 | 6.513 | 30.588 | 27.233 | 33.898 | 30.222 |
| December | 7.885 | 8.775 | 6.619 | 31.306 | 27.836 | 34.329 | 31.086 |
| Year | 7.025 | 8.428 | 7.271 | 32.524 | 30.281 | 36.359 | 33.319 |

New York quotations, cents per pound. London, pounds sterling per long ton.
(a) Bid quotation.

## Lead

| | New York | | St. Louis | | London | | | |
|---|---|---|---|---|---|---|---|---|
| | 1933 | 1934 | 1933 | 1934 | 1933 Spot | 1933 3 Mos. | 1934 Spot | 1934 3 Mos. |
| January | 3.000 | 4.000 | 2.875 | 3.900 | 10.458 | 10.833 | 11.304 | 11.517 |
| February | 3.000 | 4.000 | 2.875 | 3.900 | 10.431 | 10.719 | 11.634 | 11.913 |
| March | 3.146 | 4.000 | 3.021 | 3.900 | 10.609 | 10.821 | 11.545 | 11.842 |
| April | 3.260 | 4.179 | 3.135 | 4.042 | 10.872 | 11.122 | 11.500 | 11.794 |
| May | 3.654 | 4.140 | 3.525 | 3.990 | 12.095 | 12.372 | 11.051 | 11.341 |
| June | 4.173 | 3.975 | 4.023 | 3.825 | 13.280 | 13.571 | 11.054 | 11.253 |
| July | 4.452 | 3.772 | 4.303 | 3.623 | 13.411 | 13.613 | 10.813 | 11.045 |
| August | 4.500 | 3.747 | 4.350 | 3.597 | 12.182 | 12.457 | 10.821 | 11.028 |
| September | 4.500 | 3.685 | 4.350 | 3.535 | 11.932 | 12.229 | 10.388 | 10.613 |
| October | 4.313 | 3.654 | 4.176 | 3.504 | 11.804 | 12.102 | 10.359 | 10.554 |
| November | 4.288 | 3.567 | 4.146 | 3.417 | 11.537 | 11.778 | 10.432 | 10.597 |
| December | 4.141 | 3.604 | 4.042 | 3.454 | 11.431 | 11.658 | 10.316 | 10.500 |
| Year | 3.869 | 3.860 | 3.735 | 3.724 | 11.670 | 11.940 | 10.935 | 11.166 |

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

## Tin

| | New York | | London | |
|---|---|---|---|---|
| | 1933 | 1934 | 1933 | 1934 |
| | Straits | | Standard, Spot | |
| January | 22.692 | 51.891 | 145.708 | 226.631 |
| February | 23.500 | 51.668 | 148.544 | 226.731 |
| March | 24.221 | 53.838 | 149.120 | 233.863 |
| April | 27.136 | 55.622 | 157.944 | 239.181 |
| May | 36.051 | 53.541 | 186.207 | 234.239 |
| June | 44.097 | 51.271 | 219.964 | 226.875 |
| July | 46.356 | 51.930 | 216.673 | 230.381 |
| August | 44.794 | 51.953 | 215.210 | 228.114 |
| September | 46.665 | 51.503 | 216.893 | 229.888 |
| October | 47.858 | 50.951 | 223.455 | 230.587 |
| November | 53.011 | 51.227 | 226.722 | 228.602 |
| December | 52.936 | 50.902 | 227.678 | 228.178 |
| Year | 39.110 | 52.191 | 194.510 | 230.273 |

New York quotations, cents per pound. London, pounds sterling per long ton.

## Zinc

| | St. Louis | | London | | | |
|---|---|---|---|---|---|---|
| | 1933 | 1934 | 1933 Spot | 1933 3 Mos. | 1934 Spot | 1934 3 Mos. |
| January | 3.018 | 4.271 | 14.381 | 14.595 | 14.688 | 14 943 |
| February | 2.666 | 4.384 | 13.866 | 14.119 | 14.844 | 15.125 |
| March | 2.987 | 4.368 | 14.647 | 14.674 | 14.735 | 15.033 |
| April | 3.298 | 4.370 | 14.951 | 15.208 | 14.916 | 15.200 |
| May | 3.805 | 4.346 | 15.505 | 15.660 | 14.722 | 14.966 |
| June | 4.348 | 4.240 | 16.988 | 16.774 | 14.241 | 14.467 |
| July | 4.878 | 4.317 | 17.795 | 17.789 | 13.466 | 13.693 |
| August | 4.916 | 4.281 | 16.869 | 17.031 | 13.682 | 13.756 |
| September | 4.699 | 4.049 | 16.810 | 17.042 | 12.644 | 12.847 |
| October | 4.748 | 3.832 | 16.310 | 16.599 | 12.217 | 12.353 |
| November | 4.520 | 3.732 | 15.048 | 15.349 | 12.000 | 12.281 |
| December | 4.461 | 3.711 | 14.826 | 15.059 | 11.730 | 12.016 |
| Year | 4.029 | 4.158 | 15.666 | 15.825 | 13.657 | 13.890 |

St. Louis quotations, cents per pound. London, pounds sterling per long ton.

## Cadmium and Aluminum

| | Cadmium | | Aluminum | |
|---|---|---|---|---|
| | 1933 | 1934 | 1933 | 1934 |
| January | 55.000 | 55.000 | 23.300 | 23.300 |
| February | 55.000 | 55.000 | 23.300 | 23.300 |
| March | 55.000 | 55.000 | 23.300 | 23.300 |
| April | 55.000 | 55.000 | 23.300 | 23.300 |
| May | 55.000 | 55.000 | 23.300 | 23.300 |
| June | 55.000 | 55.000 | 23.300 | 23.300 |
| July | 55.000 | 55.000 | 23.300 | 23.300 |
| August | 55.000 | 55.000 | 23.300 | 23.300 |
| September | 55.000 | 55.000 | 23.300 | 23.300 |
| October | 55.000 | 55.000 | 23.300 | 23.300 |
| November | 55.000 | 55.000 | 23.300 | 23.300 |
| December | 55.000 | 55.000 | 23.300 | 23.300 |
| Year | 55.000 | 55.000 | 23.300 | 23.300 |

Aluminum in cents per pound, 99 per cent grade.
Cadmium, cents per pound.

## Antimony, Quicksilver, and Platinum

| | Antimony (a) New York | | Quicksilver (b) New York | | Platinum (c) New York | |
|---|---|---|---|---|---|---|
| | 1933 | 1934 | 1933 | 1934 | 1933 | 1934 |
| January | 5.722 | 7.198 | 48.500 | 67.538 | 26.480 | 38.000 |
| February | 5.738 | 7.172 | 48.614 | 72.011 | 24.000 | 38.000 |
| March | 5.901 | 7.545 | 52.676 | 75.472 | 24.667 | 38.000 |
| April | 5.876 | 7.918 | 54.580 | 75.930 | 26.800 | 38.000 |
| May | 6.264 | 8.465 | 56.500 | 75.577 | 28.500 | 36.538 |
| June | 6.500 | 7.900 | 60.038 | 75.000 | 30.000 | 36.000 |
| July | 7.262 | 8.024 | 62.900 | 75.000 | 32.320 | 36.000 |
| August | 6.986 | 8.514 | 63.500 | 75.000 | 33.000 | 36.000 |
| September | 6.880 | 8.745 | 64.580 | 74.563 | 34.560 | 36.000 |
| October | 6.843 | 9.361 | 66.500 | 74.000 | 36.000 | 35.038 |
| November | 7.113 | 12.239 | 66.000 | 73.283 | 37.583 | 35.000 |
| December | 7.250 | 13.730 | 66.330 | 73.000 | 38.000 | 35.000 |
| Year | 6.528 | 8.901 | 59.227 | 73.865 | 30.993 | 36.465 |

(a) Antimony quotations in cents per pound, for ordinary brands. (b) Quicksilver in dollars per flask of 76lb. (c) Platinum in dollars per ounce troy.

## Pig Iron

| | Bessemer | | Basic | | No. 2 Foundry | |
|---|---|---|---|---|---|---|
| | 1933 | 1934 | 1933 | 1934 | 1933 | 1934 |
| January | 14.50 | 18.00 | 14.00 | 17.00 | 14.50 | 17.50 |
| February | 14.50 | 18.00 | 14.00 | 17.00 | 14.50 | 17.50 |
| March | 14.50 | 18.00 | 14.00 | 17.00 | 14.50 | 17.50 |
| April | 14.50 | 18.48 | 14.00 | 17.48 | 14.50 | 17.98 |
| May | 15.42 | 19.00 | 14.42 | 18.00 | 14.92 | 18.50 |
| June | 16.00 | 19.00 | 15.00 | 18.00 | 15.50 | 18.50 |
| July | 16.50 | 19.00 | 15.50 | 18.00 | 16.00 | 18.50 |
| August | 17.00 | 19.00 | 16.00 | 18.00 | 16.50 | 18.50 |
| September | 18.00 | 19.00 | 17.00 | 18.00 | 17.50 | 18.50 |
| October | 18.00 | 19.00 | 17.00 | 18.00 | 17.50 | 18.50 |
| November | 18.00 | 19.00 | 17.00 | 18.00 | 17.50 | 18.50 |
| December | 18.00 | 19.00 | 17.00 | 18.00 | 17.50 | 18.50 |
| Year | 16.24 | 18.707 | 15.41 | 17.707 | 15.91 | 18.207 |

Iron in dollars per long ton. F.o.b. Mahoning and Shenango Valley furnaces.

H. C. PARMELEE
Editorial Director

# Engineering and Mining Journal

A. W. FISHER
Manager

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WILLARD CHEVALIER
Vice-President

LIFE BEGINS AT FORTY. The Midas, Nev., Chamber of Commerce announces that 1934 will go down in the history of the Gold Circle mining district as "the Year of Old Men." The two most important strikes of the year were made by youngsters of 75 and 90 years of age. It seems that Al Gabbert's famous pipe started a conflagration that uncovered a placer deposit. He is 90 and his partner Tom Van Orman is 75. Jim Anthony, who opened the rich St. Anthony oreshoot, also is 75.

•

REFERENCE in these columns to the use of copper sulphate to check the growth of microorganisms, and our somewhat facetious speculation on the cause of death of diatoms, lead F. F. Burr to transmit the interesting information that a diatomite deposit at Beddington, Maine, contains small quantities of copper silicate.

•

REFINING LEAD BULLION electrolytically by the Betts process has been generally held impractical until recently, when metallurgists of Cerro de Pasco Copper Corporation, in Peru, removed the difficulties and certain misconceptions. Dip washing of the anode slime blanket and a limited corrosion period were all that were necessary to do the trick. A patent has been granted to T. E. Harper, Jr., and Gustave Reinberg, of the company's laboratories, who will shortly describe their work.

•

RE-TREATMENT OF TAILINGS at a liberal profit always affords material for an interesting story, even when the money was made and spent a score of years ago. The chance of doing likewise under present-day conditions is what intrigues the reader. Next month A. E. Place will tell how an investment of $5,000 returned a gross half million—all from cyaniding 70,000 tons of sand.

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AERIAL SURVEY MAPS serve other purposes than those of geological examination and travel. Information as to forest growth, required for an inventory, and details of a waterfall or reservoir necessary for a water-power survey, may also be obtained. According to Canada's Air Service Bureau, the data for all this may be secured in a single operation. Surprising slowness has been shown in applying this useful art to the study of the older mining districts of the United States.

•

SELENIUM POISONING, determined by the Bureau of Chemistry and Soils as the cause of "blind staggers" in cattle, has led to the discovery of widespread distribution of selenium in the semi-arid soils of some Western states. Concentration of this toxic element in the soil varies from one region to another, and infected areas can be determined only by extensive soil surveys. Investigations made thus far indicate that at least 50,000 acres of agricultural land should be withdrawn from production. Concentrations of 3 to 5 parts per million are not dangerous in either food or feed, but from 15 parts per million up are definitely associated with chronic selenium poisoning.

•

FEEDER TIME is lost when ore hangs up in mill and smelter bins. Possibly, also, some one's temper. In no case is the incident exactly comforting. Years of experience teach an operator a thing or two not found in data books for designers. In an early issue useful suggestions on the subject will be passed along for those who need them by L. D. Anderson, long connected with the United States Smelting company and now a consulting engineer. Something for those who want to keep the ore a-moving.

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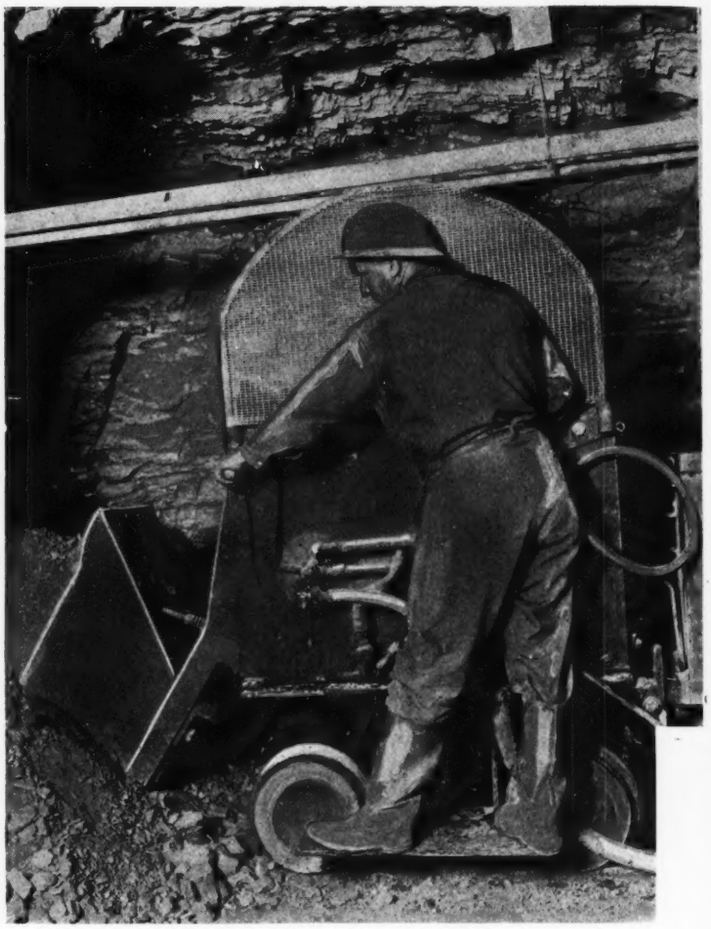

*The accompanying illustration shows the EIMCO-FINLAY LOADER at work in Mt. Isa Mines. Detailed information regarding money-saving performance of EIMCO-FINLAY LOADERS will be sent promptly on request.*

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